

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE J		PAGE OF PAGES 1 120	
2. AMENDMENT/MODIFICATION NO. 0002		3. EFFECTIVE DATE 11-Dec-2002		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable) POC: Mary C. Renaud	
6. ISSUED BY USACE, CONTRACTING DIVISION 7400 LEAKE AVE, ATTN: CEVMN-CT, RM 172 NEW ORLEANS LA 70118		CODE DACW29		7. ADMINISTERED BY (If other than item 6) See Item 6		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				<input checked="" type="checkbox"/> X		9A. AMENDMENT OF SOLICITATION NO. DACW29-02-B-0069	
				<input checked="" type="checkbox"/> X		9B. DATED (SEE ITEM 11) 26-Aug-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> X The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> X is extended, <input type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u> 1 </u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) The above numbered solicitation for Lake Pontchartrain, Louisiana and Vicinity, St. Charles Parish High Level Plan, Reach 1 Structures, Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway, St. Charles Parish, Louisiana, is amended as shown on the attached pages. <div style="text-align: center;">BID OPENING DATE</div> A BID OPENING DATE OF 7 JANUARY 2003, 2:00 PM LOCAL TIME, IS HEREBY ESTABLISHED.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 11-Dec-2002	

SECTION 00010

Delete the bidding schedule pages 00010-3 thru 00010-6 in its entirety and substitute the attached revised bidding schedule pages 00010-3 thru 00010-7.

SECTION 00700

Page 87, EFARS 52.232-5001, "CONTINUING CONTRACTS," subparagraph (b) – In the first sentence, delete "\$50,000.00" and replace with \$10,000.00."

SECTION 01330

Submittal Register. Item 69, change "Waterstops for Joints in Concrete" to "Waterstops". Item 76, change "Concrete Mixing" to "Concrete Mixers".

SECTION 01356

Page 8, paragraph (a). Delete the 3rd sentence in its entirety and insert, "The work consists of clearing and grubbing, an access road to the job site, an access road on the existing levee berm, ramps across the levee, driving of approximately 260 linear feet of I-Wall sheet pile and approximately 300 linear feet of cut-off sheet pile, constructing approximately 160 linear feet of reinforced concrete inverted T-Wall, two reinforced concrete drainage structures, one with two(2) 4' x 4' sluice gates and one(1) with one(1) 4' x 4' sluice gate, approximately 960 linear feet of channel excavation, approximately 2,261 linear feet of levee embankment consisting of compacted and uncompacted clay fill obtained from the structures and channel excavation and from the clay borrow area in the Bonnet Carre' Spillway and hauled to the site by truck, and removal of 2 existing culverts."

SECTION 01451

Page 1, paragraph 1.1. ASTM D 3740, change "(1999c)" to "(2001)". ASTM E 329, change "(2000a)" to "(2000b)".

SECTION 02075

Page 1, paragraph 1.2. ASTM D 4884, change "Seam Strength of Sewn Geotextiles" to "Strength of Sewn or Thermally Bonded Seams of Geotextiles."

SECTION 02077

1. Page 1, paragraph 1.2. ASTM D 4632, delete in its entirety and insert “ASTM D 4595 (1994) Tensile Properties of Geotextiles by the Wide Width Strip Method.”
2. Page 4, TABLE 1. First and third row, change “ASTM D 4632” to “ASTM D 4595”. Delete the asterisked note after the table.

SECTION 02231

1. Page 1, paragraph 1.1. Delete this paragraph in its entirety and insert: “The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and for performing all operations necessary for the clearing and grubbing of the levee fill foundation (as shown on the drawings and as described below), clearing and grubbing the clay borrow area in the Bonnet Carre’ Spillway and areas for the two drainage structures, including T-walls and uncapped sheetpile I-walls, as shown on the drawings, and the clearing and removal of Rip Rap during the closure operation of the existing drainage ditch near Almedia Drainage Structure, and disposal of all cleared and grubbed materials, as specified herein.”
2. Page 3, subparagraph 3.2.5. Change all occurrences of “semicompacted” to “compacted.”
3. Page 3, subparagraph 3.2.6.1. Delete the 2nd sentence in its entirety and insert, “The entire area to be occupied by the access road shall be cleared. Rip Rap shall remain in place during the construction of the Almedia Drainage Structure. During closure operations of the existing drainage ditch, the rip rap shall be removed from the site and become the property of the contractor.”
4. Page 5, subparagraph 3.4.4. Line 1, after debris, insert “(including rip rap)”.

SECTION 02273

1. Page 1, paragraph 1.2. ASTM C 127, change “Specific Gravity and Absorption of Coarse Aggregate” to “Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.”
2. Page 1, paragraph 1.2. Insert the following ASTM references:
“ASTM C 88 (1999) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate”

“ASTM C 131 (2001) Resistance of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine”

“ASTM D 75 (1997) Sampling Aggregates”

3. Page 5, subparagraph 2.1.2. Line 3, insert “gradation” in front of test. After the last sentence, insert “Bedding shall show an abrasion loss of not more than 40 percent when tested in accordance with ASTM C 131 and a soundness loss of not more than 15 percent when subjected to 5 cycles of the magnesium sulfate soundness test in accordance with ASTM C 88.”

4. Page 7, subparagraph 3.3.1. First row in the table, change “GRADATIONS” to “GRADATION”.

SECTION 02318

Page 2, subparagraph 1.3.3. Delete the 1st first sentence in its entirety and insert “Payment for removing the two 36” diameter corrugated metal pipe drainage culverts (approximately 60’ long) at approximate levee section 485+00 will be made at the contract Lump Sum price for “Removal of Existing Culverts”.”

SECTION 02320

1. Page 4, subparagraph 1.5(6)(a). Line 8, change “Structural Excavation” to “Structural Backfill”.

2. Page 7, subparagraph 3.1.1. Delete this paragraph in its entirety and insert, “The Contractor shall make all excavations required for the construction of the floodwall, and for the drainage structure to the lines and grades shown on the drawings. The structural excavation between elevations –6.33 and –8.33 for the Walker Canal Drainage Structure shall be performed as a strip and backfill operation. The Contractor shall excavate below elevation –6.33 in strips not to exceed 10 feet in width before placing the sand fill back to elevation –6.33, see drawings for location and layout of excavation. The structural excavation for the Almedia Drainage Structure does not require any specific strip and backfill operations. Material from the required structural excavation shall be used as sand fill except as stated below. Excess materials over and above that required for sand fill shall be placed in the Disposal Areas 1 and 2 for Almedia and 1 through 4 for Walker Canal Drainage Structure as shown on the drawings. Materials not meeting the requirements of Section 02332 paragraphs 1.7.1 and 1.7.2 shall not be used as sand fill and shall be disposed of in the proper disposal area”

3. Page 8, subparagraph 3.1.3. Delete the 5th sentence in its entirety and insert, “Material for structural backfill shall be obtained from a commercial source.” Delete the 7th sentence in its entirety.

SECTION 02332

1. Page a, Table of Contents. Change “3.1.2 Semicompacted and Uncompacted Fill Foundation Preparation” to “3.1.2 Compacted and Uncompacted Fill Foundation Preparation”. Page b, change “3.2.2 Semicompacted Fill” to “3.2.2 Compacted Fill”.
2. Page 1, paragraph 1.2. ASTM D 2922, change “(1996)” to “(2001)”.
3. Page 2, paragraph 1.2. ASTM D 3740, change “(1996)” to “(2001)”.
4. Page 3, subparagraph 1.3.2. Delete this paragraph in its entirety and insert, “Sand Fill placed will be measured for payment by the cubic yard, and quantities will be determined by the average end area method. The basis for measurement will be cross sections taken of the area to be filled after clearing, grubbing, and vegetation removal. Sand fill not constructed to the design grade and section, including the allowable as indicated on the Contractor’s compliance surveys, will not be accepted.”
5. Page 9, subparagraph 1.7.1. Delete the 2nd sentence in its entirety and insert, “The sand fill shall be obtained from the material excavated in the structural excavations.”

SECTION 02365

Delete Section 02365 in its entirety and substitute the attached revised Section 02365.

SECTION 02411

1. Page 2, subparagraph 1.5.1. Delete the 2nd sentence in its entirety and insert, “Price and Payment shall constitute full compensation for fabricating, furnishing, handling, driving, cutting holes, backfilling voids, and all other work incidental to acceptably installing the steel sheet piling.
2. Page 3, Insert new subparagraph 1.5.5 as follows:

“1.5.5 Painting of Sheet Pile

No measurement will be made for the painting of the sheet pile. Payment for painting of sheet pile performed at each drainage structure shall be made as specified in Section 09940, “Painting.”

3. Page 6, paragraph 2.1. Delete the table “PROPERTIES OF SECTIONS” in its entirety and replace with the following:

PROPERTIES OF SECTIONS

Type of section	Minimum web thickness (inches)	Section modulus (in ³ /ft of wall)	Moment of inertia (in ⁴ /ft of wall)	Nominal section depth (inches)	Minimum interlock strength (lbs/lin in)	Maximum theoretical driving width (inches)
PZ 22	0.335	18.1	84.4	9	N/A	27

4. Page 7, subparagraph 2.1.2. Delete the first paragraph in its entirety and insert, “At no additional cost to the Government, new Z-type cold rolled sheet piling conforming to ASTM A 572, Grade 50, with a minimum material thickness of .335-inches, a maximum overall width of 27 inches and meeting the following sections properties, may be substituted in kind for the sheetpile located under the center of the drainage structures, the T-walls adjacent to the drainage structures, the drainage structures wingwalls and the north and south ends of the drainage structures.”

SECTION 02731

Delete Section 02731 in its entirety and substitute the attached revised Section 02731.

SECTION 03101

1. Page 1, paragraph 1.3. Delete ASTM C 1074 in its entirety.

2. Page 4, subparagraph 2.1.1.1. Delete this paragraph in its entirety and insert, “This class of finish shall apply to all exterior formed surfaces not covered by backfill and the interior of drainage structure. The form facing material shall be composed of new, well-matched tongue and groove lumber of new plywood panels conforming to DOC PS-1, either Grade B-B (Concrete Form), Class I or Grade B-B High Density Concrete Form Overlay, Class I. The Grade B Side shall be stamped as such and shall face the concrete.”

SECTION 03301

Delete Section 03301 in its entirety and substitute the attached revised Section 03301.

SECTION 05500

Page 6, subparagraph 2.1.6. Delete the second paragraph in its entirety and insert, "Serrated Galvanized steel grating 1 ½" x 3/16" type B, as manufactured by IKG Industries or approved equal."

SECTION 09940

Delete Section 09940 in its entirety and substitute the attached revised Section 09940.

DRAWINGS

1. Delete drawings 3-6a, 10-14, 16-17, and 41 of 105 in their entirety and substitute with revised drawings 3-6a, 10-14, 16-17, and 41 of 105.

2. Dwg. 2 of 105. CONCRETE NOTES, Note 2, line 2, after "POZZOLAN" add "OR SLAG". CONCRETE NOTES, Note 5, line 3, change "INTERGRITY" to "INTEGRITY". GENERAL NOTES, insert note 8:

"8. PLANS FOR THE EXISTING LEVEE ADJACENT TO THE TWO DRAINAGE STRUCTURES ARE AVAILABLE FOR REVIEW AT THE U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, CORPS OF ENGINEERS, ATTN: CEMVN-ED, P.O. BOX 60267, UPON REQUEST."

3. Dwg 16 of 105. Columns B and C and 2, 3, and 4, change the bottom of the excavation from "EL. -7.5" to EL. -7.53"

4. Dwg. 19 of 105. Columns C and 1 and C and 5, change "12" RIPRAP OVER 22" OF BEDDING" to "22" RIPRAP OVER 12" BEDDING". Columns C and 3, change "MOTOR OPERATED LIFTING DEVICE" to "LIFTING DEVICE". Columns C and 3, change "CRUSHED STONE" to "SURFACING".

5. Dwg. 23 of 105. SECTION B, columns A and 5, SECTION D, columns C and 3, and SECTION A, columns C and 5, the elevation of the bottom of the base slab should be changed from "EL. -7.3" to "EL. -7.2".

6. Dwg. 30 of 105. TYPICAL PANEL DETAIL, columns C and 1, bottom center call out, change "22 - ½" x 9" FLAT BAR @ 4" O.C. = 7'-0"" to "22 - ½" x 6" FLAT BAR @ 4" O.C. = 7'-0"". TYPICAL PANEL DETAIL, columns C and 2 and 3, right hand side dimensions, extend the dimension lines the entire length of the ½" x 6" FLAT BAR. DETAIL 1, TYPICAL DETAIL OF SCREEN F.B. AND PIPE STIFFENER ASSEMBLY, columns A and 2, upper center note, change "½" x 9" GALVANIZED STEEL F.B." to "½" x 6" GALVANIZED STEEL F.B."

7. Dwg. 31 of 105. "ELEVATION THRU TRASH RACK SLOT", Columns D and 1 and 2, change the dimension of the C.R.S. embedded Plate from "3/8 x 1'-4 1/2" x 7'-0", C.R.S." to "3/8" x 1'-4 1/2" x 7'-6", C.R.S." DETAIL 1, columns A and 5, change the dimension of the C.R.S. embedded Plate from "3/8" x 1'-4 1/2" x 7'-0" to "3/8" x 1'-4 1/2" x 7'-6".

8. Dwg. 32 of 105. "ELEVATION THRU TRASH RACK SLOT", Columns D and 1 and 2, change the dimension of the C.R.S. embedded Plate from "3/8 x 1'-4 1/2" x 7'-0", C.R.S." to "3/8" x 1'-4 1/2" x 7'-6", C.R.S." DETAIL 1, columns A and 3 and 4, change the dimension of the C.R.S. embedded Plate from "3/8" x 1'-4 1/2" x 7'-0" to "3/8" x 1'-4 1/2" x 7'-6".

9. Dwg. 33 of 105. PLAN AT EL. 12.3. Columns D and 4, upper dimension call out, change "16'-0" to "10'-0". PLAN AT EL. 12.3. Columns C and D and 3, left hand center dimension, change "6'-0" to "5'-0".

10. Dwg. 40 of 105. Columns A and 1 and 2, delete the note in its entirety and insert, "STRIP AND BACKFILL OPERATION FOR EXCAVATION BELOW EL. -6.33, EXCAVATE 10-FOOT WIDE STRIPS (MAXIMUM) TWO FEET BELOW EL. -6.33 AND BACKFILL WITH SAND PRIOR TO PLACEMENT OF STABILIZATION SLAB. SEE SECTIONS ON DRAWING 41."

11. Dwg. 41 of 105. SECTION C, columns A and 3, change the call out of the bottom of the Structural Backfill from "El. -6.08" to "El. -6.00".

12. Dwg. 43 of 105. Columns C and 1 and C and 5, change "12" RIPRAP OVER 22" OF BEDDING" to "22" RIPRAP OVER 12" BEDDING". Columns C and 3, change "MOTOR OPERATED LIFTING DEVICE" to "LIFTING DEVICE".

13. Dwg. 57 of 105. PLAN AT EL. 12.3. Columns D and 2, left hand center dimension, change "6'-0" to "5'-0".

14. Dwgs. 86-97 of 105. Delete "CUT AREA = ..." and "FILL AREA = ..." below the station numbers on each of the cross sections.

SECTION 00010 - BIDDING SCHEDULE

Lake Ponchartrain, Louisiana and Vicinity, High Level Plan, Reach 1 Structures,
Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway,
St. Charles Parish, Louisiana

Item	DESCRIPTION	Estimated Quantity	Unit	Unit Price	Estimated Amount
0001	Mobilization and Demobilization	1	LS		
0002	Truck Wash Down Rack	1	LS		
	Almedia Drainage Structure				
0003	Clearing and Grubbing	1	LS		
0004	Structural Excavation	1	LS		
0005	Construction Dewatering	1	LS		
0006*	Geotextile Separator	4600	SY		
0007	Reinforcement Geotextile	3856	SY		
0008*	Bedding	36	CY		
0009*	Riprap	100	TON		
0010*	Channel Excavation	2000	CY		
0011	Structural Backfill	1	LS		
0012*	Compacted Fill	13000	CY		
0013*	Uncompacted Fill	11250	CY		
0014*	Sand Fill	3500	CY		
0015	Piling, Concrete Precast, Prestressed (14"x14")	6085	LF		
0016*	Steel Sheet Piling, Type Z	6050	SF		

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Lake Ponchartrain, Louisiana and Vicinity, High Level Plan, Reach 1 Structures,
Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway,
St. Charles Parish, Louisiana

Item	DESCRIPTION	Estimated Quantity	Unit	Unit Price	Estimated Amount
0017*	Roofing/Seepage Piling				
	Steel Sheet, Type Z (Option 1)	1570	SF		
	Vinyl Sheet, Type Z (Option 2)	1570	SF		
0018	Concrete - Stabilization Slab	1	LS		
0019	Reinforced Concrete – Drainage Structure	1	LS		
0020	Reinforced Concrete – T-Walls & Wingwalls	1	LS		
0021	Fertilizing and Seeding	10	AC		
0022	Surfacing, Crushed Stone				
0022AA	First 1150	1150	CY		
0022AB	All Over 1150	350	CY		
0023	Miscellaneous Metalwork	1	LS		
0024*	Trash Racks	2	EA		
0025	Clay Cofferdam	1700	CY		
0026*	Bulkheads	2	EA		
0027	Sluice Gates and Hoists	1	EA		
0028*	Chain Link Fencing	280	LF		
0029*	Gates	4	EA		
0030*	Painting	1	LS		
	Walker Canal/Parish Line Drainage Structure				

SECTION 00010 - BIDDING SCHEDULE

Lake Ponchartrain, Louisiana and Vicinity, High Level Plan, Reach 1 Structures,
Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway,
St. Charles Parish, Louisiana

Item	DESCRIPTION	Estimated Quantity	Unit	Unit Price	Estimated Amount
0031	Clearing and Grubbing	1	LS		
0032	Structural Excavation	1	LS		
0033	Construction Dewatering	1	LS		
0034*	Geotextile Separator	24500	SY		
0035	Reinforcement Geotextile	4125	SY		
0036*	Bedding	45	CY		
0037*	Riprap	125	TON		
0038*	Channel Excavation	2100	CY		
0039	Structural Backfill	1	LS		
0040*	Compacted Fill	15300	CY		
0041*	Uncompacted Fill	12000	CY		
0042*	Sand Fill	7120	CY		
0043	Piling, Concrete Precast, Prestressed (14"x14")	7028	LF		
0044*	Steel Sheet Piling, Type Z	6150	SF		
0045*	Roofing/Seepage Piling				
	Steel Sheet, Type Z (Option 1)	1550	SF		
	Vinyl Sheet, Type Z (Option 2)	1550	SF		
0046	Concrete – Stabilization Slab	1	LS		
0047	Reinforced Concrete – Drainage Structure	1	LS		
0048	Reinforced Concrete – T-Walls & Wingwalls	1	LS		
0049	Fertilizing and Seeding	7	AC		

SECTION 00010 - BIDDING SCHEDULE

Lake Ponchartrain, Louisiana and Vicinity, High Level Plan, Reach 1 Structures,
Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway,
St. Charles Parish, Louisiana

Item	DESCRIPTION	Estimated Quantity	Unit	Unit Price	Estimated Amount
0050	Clay Cofferdam	2000	CY		
0051*	Surfacing, Crushed Stone				
0051AA	First 6000	6000	CY		
0051AB	All Over 6000	1500	CY		
0052	Miscellaneous Metalwork	1	LS		
0053*	Trash Racks	4	EA		
0054	Bulkheads	2	EA		
0055	Sluice Gates and Hoists	2	EA		
0056	Removal of existing culverts	1	LS		
0057*	Chain Link Fencing	280	LF		
0058*	Gates	4	EA		
0059	Painting	1	LS		

Bidders should bid on Item #17, Option 1 or Option 2, but not both.
Bidders should bid on Item #45, Option 1 or Option 2, but not both.

TOTAL: \$

Award will be made as a whole to one bidder.

* - Items added or Quantities changed during Amendment No. 0002

NOTE 1: Bidders shall furnish unit prices for each item listed in the Schedule requiring a unit price. If the bidder fails to insert a unit price in the appropriate blank for required item(s), but does furnish an extended total, or an estimated amount for such item(s), the Government shall deem the unit price to be the quotient obtained by dividing the extended amount for that line item by the quantity. IF A BIDDER OMITTS BOTH THE UNIT PRICE AND THE EXTENDED TOTAL OR ESTIMATED AMOUNT FOR ANY ITEM, ITS BID SHALL BE DECLARED NON-RESPONSIVE AND THEREFORE INELIGIBLE FOR AWARD.

NOTE 2: THE NOTICE TO PROCEED (NTP): The successful bidder is advised that performance and payment bonds shall be submitted in accordance with the time frame in block 12B of SF 1442 after Notice of Award. The NTP will be issued immediately after verification of acceptable performance and payment bonds. Within seven (7) days after issuance of the NTP,

SECTION 00010 - BIDDING SCHEDULE

Lake Ponchartrain, Louisiana and Vicinity, High Level Plan, Reach 1 Structures,
Almedia and Walker Canal/Parish Line Drainage Structures, North of Airline Highway,
St. Charles Parish, Louisiana

Item	DESCRIPTION	Estimated Quantity	Unit	Unit Price	Estimated Amount
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the Contractor shall initiate a meeting to discuss the submittal process with the Area or Resident Engineer or his authorized representative. Physical work cannot start until the Accident Prevention Program, Contractor Quality Control Plan, and other submittals which may be required, have been submitted and approved and all preliminary meetings called for under the contract, have been conducted.

NOTE 3: IF BIDS INCLUDE FOREIGN MATERIALS, INCLUDING SHEETPILE THE MATERIAL MUST BE SHIPPED ON A U.S. FLAG VESSEL (PLEASE REFER TO CLAUSES FAR 52.247-64 AND DFAR 252.247-7023). TO OBTAIN A WAIVER COULD TAKE A SIGNIFICANT AMOUNT OF TIME, AND THERE IS NO GUARANTEE THAT A WAIVER WILL BE GRANTED. THIS PROCESS COULD IMPACT THE DELIVERY SCHEDULE, AND THE GOVERNMENT ASSUMES NO RESPONSIBILITY DUE ANY DELAYS CAUSED BY THE WAIVER PROCESS.

EVALUATION OF SUBDIVIDED ITEMS. (EFARS 52.212-5000 - MAR 95).

Item No. 0022 and 0051 are subdivided into two or more estimated quantities and are to be separately priced. The Government will evaluate each of these items on the basis of total price of its sub-items.

VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS. (EFARS 52.212-5001 - MAR 95).

The Variations in Estimated Quantities Subdivided Items clause is applicable only to Item Nos. 0022 and 0051.

a. Variations from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

b. Where the actual quantity of work performed for Item Nos. 0022 and 0051 is less than 85% of the quantity of the first sub-item listed under such items, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment in contract price shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantity -- Apr 84.

c. If the quantity of work performed under Item Nos. 0022 or 0051 exceeds 115% or is less than 85% of the total estimated quantity of the sub-items under that item, and/or if the quantity of work performed under the second sub-item or any subsequent sub-item under Item No. **NONE** exceeds 115% or is less than 85% of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract, the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantity.

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SECTION 02365 - PRESTRESSED CONCRETE PILES

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, equipment, labor, and materials, and performing all operations in connection with the manufacture, and installation of prestressed concrete piles.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

SP-66 ACI Detailing Manual (1988)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 27	(2000) Steel Castings, Carbon, for General Application
ASTM A 36	(2001) Structural Steel
ASTM A 82	(2001) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 416	(1999) Steel Strand, Uncoated Seven-Wire Prestressed Concrete
ASTM A 572	(2001) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 615	(2001b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706	(2001) Low-Alloy Steel Deformed Bars for Concrete Reinforcement
ASTM C 33	(2002a) Concrete Aggregates
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C 150	(2002) Portland Cement
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete
ASTM C 494	(1999a) Chemical Admixtures for Concrete
ASTM C 595	(2002) Blended Hydraulic Cement
ASTM C 618	(2001) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement
ASTM C 666	(1997) Resistance of Concrete to Rapid Freezing and Thawing

AMERICAN WELDING SOCIETY, INC. (AWS)

D1.4	(1994) Structural Welding Code - Reinforcing Steel
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CORPS OF ENGINEERS (COE)

CRD-C 400	(1963) Water for Use in Mixing or Curing Concrete
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PRESTRESSED CONCRETE INSTITUTE (PCI)

MNL 116	(1985) Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products
STD 112	(1984) Standard Prestressed Concrete Piles Square, Octagonal and Cylinder

LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES (LSSRB). 2000 EDITION, STATE OF LOUISIANA, DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT (LDOTD).

1003.02	Aggregates for Portland Cement Concrete and Mortar
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MISSISSIPPI STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (MSSRBC). 1990 EDITION, MISSISSIPPI STATE HIGHWAY DEPARTMENT (MSHD)

703.02	Fine Aggregate for Portland Cement Concrete
703.03	Coarse Aggregate for Portland Cement Concrete

1.3 MEASUREMENT

Precast prestressed concrete piles will be measured for payment on the basis of lengths along the axis of the pile in place below the cut-off elevation and shall be limited to the lengths as shown on the drawings. Pile lengths will be measured to the nearest tenth of a foot. The portion of any pile driven below the tip elevation shown on the drawings will not be measured for payment unless overdriving is directed by the Contracting Officer. Pulled piles shall be measured for payment on the basis of lengths along the axis of the pile pulled above the cut-off elevation. Redriving of pulled piles will be measured in accordance with the provisions stated hereinabove for originally driving the piles. Cut offs shall be measured for payment on the basis of total length minus driving head length provided that this length is not greater than the difference between the total length of piles shown on the plans for that location and the length of piles driven below the point of cut off.

1.4 PAYMENT

1.4.1 Driven Piles

Payment for the measured length below cut-off elevation of precast prestressed concrete piles acceptably driven will be made at the applicable contract price per linear foot for "Piling, Concrete Precast, Prestressed (14" x 14")", for the length and type of pile specified or directed to be driven; each price includes all items incidental to driving the piles, backdriving uplifted piles, cutting off all piles at the cut-off elevation, spacing of piles, and furnishing the piles.

1.4.2 Pulled Piles

1.4.2.1 Sound Piles

Each concrete pile pulled at the direction of the Contracting Officer for inspection and found to be in good condition, will be paid for at the original contract price in its original driven position plus 50 percent of the contract unit price for the length pulled which shall constitute payment for pulling. Payment for a pulled pile shall include backfilling the pile hole if required. Undamaged pulled piles when redriven acceptably will be paid for at 50 percent of the contract unit price for furnishing and driving the measured length of piles redriven, which price and payment shall constitute payment for redriving only. Pulled piles which are damaged through no fault of the Contractor shall be replaced by a new pile which will be paid for at the contract unit price for the length acceptably driven.

1.4.2.2 Damaged Piles

When a pile is pulled for inspection and found to be damaged due to Contractor negligence, no payment will be made for originally furnishing and driving such pile nor

for the operation of pulling and it shall be replaced by a new pile which will be paid for at the contract unit price for the length acceptably driven.

1.4.2.3 Misaligned or Misplaced Piles

When a pile is driven but not acceptably placed or driven out of alignment and pulled at the direction of the Contracting Officer, no payment will be made for either originally furnishing and driving such pile nor for the operation of pulling. If the pile is undamaged and it is acceptably redriven at the direction of the Contracting Officer, it will then be paid for at the contract unit price. If damaged, it shall be replaced by a new pile, which will then be paid for at the contract unit price.

1.4.3 Cut-Offs

Payment will be made for measured cut-off portion of any pile furnished by the Contractor at the rate of 50 percent of the applicable contract unit price for furnishing and installing piles. No other payment will be made for such cut-off. Cut-off portions of the piles shall be disposed of as directed by the Contracting Officer at the Contractor's expense.

1.5 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330, "SUBMITTAL PROCEDURES".

1.5.1 Data

1.5.1.1 Pile Driving Equipment: GA

Descriptions of pile driving equipment, including hammers, power packs, driving helmets, cap blocks, pile cushions, leads, extractors, jetting equipment, and preboring equipment, shall be submitted for approval at least 30 days prior to commencement of work.

The following information for each hammer proposed shall be submitted:

- (1) make and model
- (2) ram weight (pounds)
- (3) anvil weight (pounds)
- (4) weight of the moving parts of the hammer (pounds)
- (5) rated stroke (inches)

(6) rated energy range (foot-pounds)

(7) rated speed (blows per minute)

(8) steam or air pressure, hammer, and boiler and/or compressor (pounds per square inch)

(9) rated bounce chamber pressure curves or charts, including pressure correction chart for type and length of hose used with pressure gage (pounds per square inch)

(10) power pack description

(11) pile driving helmet, make, and weight (pounds)

(12) pile cushion material, type, proposed thickness, modulus of elasticity, and coefficient of restitution.

1.5.1.2 Cutting of Piles: GA

The proposed method for cutting piles for desired length and for removal of driving heads shall be submitted for approval 30 days prior to the start of pile driving.

1.5.1.3 Delivery, Storage, and Handling: GA

Delivery, storage, and handling plans for piles shall be submitted for approval at least 30 days prior to delivery of piles to the jobsite.

1.5.1.4 Concrete Mix: GA

Concrete mixture proportions shall be submitted prior to casting piles.

1.5.1.5 Curing of Piles: GA

Methods and details for curing piles shall be submitted for approval prior to casting piles.

1.5.2 Drawings

1.5.2.1 Prestressed Concrete Piles: GA

Detailed drawings of piles shall be submitted for approval at least 30 days prior to commencement of work. Drawings shall show pile dimensions and fabrication details,

including forms, reinforcement, collars, shoes, embedded or attached lifting devices, pick-up and support points. Splicing of Prestressed Piles will not be allowed.

1.5.2.2 Pile Placement and Tolerances: GA

Pile placement plans, as specified in paragraph 3.2.2, shall be submitted for approval at least 30 days prior to delivery of piles to the jobsite.

1.5.3 Statements

1.5.3.1 Voids: GA

Materials and methods for forming voids shall be submitted for approval.

1.5.3.2 Cap Blocks: GA

The make-up of the proposed cap block, including material type, dimensions, modulus of elasticity, and coefficient of restitution shall be submitted for approval. This information shall be included with the Pile Driving Equipment submittal.

1.5.4 Certificates

1.5.4.1 Certificates of Compliance: FIO

Certificates of compliance for admixtures, aggregates, cement, pozzolan, reinforcing steel, and prestressing steel shall be submitted prior to commencing fabrication of piles. Certificates for admixtures, aggregates, cement, and pozzolan shall be submitted along with concrete mix proportions. Aggregate source and gradation information shall be submitted for aggregates.

1.5.5 Records

1.5.5.1 Driving Record Forms: GA

The proposed form for recording pile driving records shall be submitted for approval 30 days prior to commencement of work. Requirements are specified in paragraph 3.2.3.1.

1.5.5.2 Driving Records: FIO

Original pile driving records shall be submitted daily.

1.6 QUALIFICATIONS

The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute, Plant Certification Program, or the manufacturer shall establish a quality control program based on PCI MNL-116, prior to the start of production.

1.7 DELIVERY, STORAGE, AND HANDLING

Piles shall be stored, handled, and transported in accordance with PCI MNL-116 except as follows. Methods used for handling and storage of piles shall be such that the piles are not subjected to excessive bending stress, cracking, spalling, or other damage. Piles which are damaged during delivery, storage, or handling to the extent they are rendered unsuitable for the work, in the opinion of the Contracting Officer, will be rejected and shall be removed from the work site at no cost to the Government.

1.7.1 Delivery and Storage

Piles shall be held at the plant until the specified ultimate compressive strength is obtained or 14 days, whichever is greater. Storage areas for piles shall be stabilized and suitable foundations provided so differential settlement or twisting of the pile does not occur. Stacked piles shall be separated and supported by uniform load transferring material placed across the full width of each bearing point and in vertical planes between the piles. The stacks shall be limited to 5 feet in height unless otherwise approved. Each pile shall be stacked in a straight position and supported every 10 feet or less along its length (ends inclusive) to prevent excessive sweep in the pile.

1.7.2 Handling

Piles shall be lifted by means of a suitable bridle or slings attached to the pile at the embedded or attached lifting devices. Unless special lifting devices are attached for pickup, pickup points shall be plainly marked on all piles after removal of the forms. Alternate pickup methods or locations shall be subject to approval prior to commencement of pile fabrication. The Contractor shall submit this request at least 30 days prior to the intended use of alternate pick-up methods. Dragging of piles across the ground will not be permitted. The Contractor shall inspect each pile for sweep and structural damage such as cracking and spalling before transporting them from the storage site to the driving area. Sweep shall be checked by placing the pile on a firm level surface and rotating the pile. Sweep shall be limited to 2 inches over the length of the pile. The Contractor shall again check the pile for excessive sweep and damage immediately prior to placement in the driving leads. Piles having excessive sweep shall not be used.

1.8 QUALITY CONTROL

1.8.1 General

The Contractor shall establish and maintain quality control for pile manufacturing and driving operations, assure compliance with contract specifications and maintain quality control records for all construction operations including, but not limited to, the following:

- (1) Testing and gradation of aggregates and compressive strength of concrete as required, including batched proportions.
- (2) Setting and bracing of forms and checkout just prior to concrete placement, including accurate placement of reinforcing steel.
- (3) Casting, handling and storage of precast, prestressed piling: records of prestressing tension strands.
- (4) Curing method and duration.
- (5) Driving of all piles and maintaining records of such.

1.8.2 Reporting

The original and two copies of these records and reports, as well as corrective action taken, shall be furnished the Government daily. Format of the report shall be as prescribed in the Section 01451, "CONTRACTOR QUALITY CONTROL."

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Admixtures

Chemical admixtures shall conform to ASTM C 494. Air-entraining admixture shall conform to ASTM C 260. Calcium chloride or admixtures containing chlorides or nitrates shall not be used.

2.1.2 Aggregates

Aggregates shall conform to ASTM C 33, except as specified otherwise herein. Aggregates shall conform to the grading requirements of either ASTM C33; LSSRB, Section 1003.02; or MSSRBC, Sections 703.02 and 703.03. Fine aggregates from different sources of supply shall not be mixed or stored in the same stockpile, or used alternately in the same concrete mix or the same structure without approval. The fineness modulus of fine aggregate shall not be less than 2.40 or greater than 3.00. For piles that will be exposed to freezing and thawing, fine and coarse aggregate subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C 88 shall show a loss not greater than 10 percent. If the selected aggregates fail the soundness test, the aggregate source may be used if the concrete specimens

made with the aggregates have a durability factor of not less than 80, based on 300 cycles of freezing and thawing, when tested in accordance with ASTM C 666.

2.1.3 Cement

ASTM C 150, Type I or II, low alkali, except that the maximum amount of C_3A in Type I cement shall be 15 percent and cement with a Blain Fineness of 400 square meters per kilogram shall be considered Type III cement.

2.1.3.1 High-Early-Strength Portland Cement

ASTM C 150, Type III, low alkali used only when specifically approved in writing.

2.1.4 Pozzolan

Pozzolan shall conform to ASTM C 618, Class C or F, with the Multiple Factor and the Effectiveness in Controlling Alkali-Silica Reaction requirements of Table 3.

2.1.5 Prestressing Steel

Prestressing steel shall be seven-wire, ½ - inch diameter, Grade 270 low relaxation stress-relieved steel strand conforming to the requirements of ASTM A416. Steel shall be free from grease, oil, wax, paint, soil, dirt, loose rust, kinks, bends, and other defects.

2.1.6 Reinforcing Steel

Non-prestressing reinforcing steel shall conform to ASTM A 615 Grade 60, deformed.

2.1.7 Ties and Spirals

Steel for ties and spirals shall conform to ASTM A 82.

2.1.8 Water

Water for mixing concrete shall be fresh, clean, drinkable, and free from injurious amounts of oils, acids, alkalis, salts, sugars, organic materials, or other substances that may be deleterious to concrete or steel. Undrinkable water may be used if it meets the requirements of COE CRD-C 400. The time of set for concrete made with undrinkable water may vary from one hour earlier to one and one-half hours later than a control sample made with distilled water.

2.2 FABRICATION

2.2.1 Prestressed Concrete Piles

Prestressed concrete piles shall be solid concrete piles of the type indicated. Piles shall be cast as monolithic units of homogeneous concrete and pretensioned with prestressing steel. Manufacturing requirements for piles shall conform to PCI MNL-116 except as modified herein. Embedded or attached lifting devices for pick-up shall be as shown on the drawings or as approved in accordance with paragraph 1.7. Pick-up points shall be marked on the piles at the indicated location after removal of the forms. Detail drawings of piles, showing dimensions and fabrication details including forms, reinforcement, collars, shoes, embedded or attached lifting devices, and pick-up points shall be submitted for approval. The Contractor shall notify the Contracting Officer 1 week prior to the date casting of piles is to begin.

2.2.2 Forms

Forms shall be of steel, braced and stiffened against deformation, accurately constructed, watertight, and supported on unyielding concrete casting beds. Form surfaces shall be within 1/4 inch of a true plane in a length of 50 feet. Forms shall permit movement of the pile without damage during release of the prestressing force. Voids shall be formed.

2.2.3 Reinforcement and Embedments

Reinforcing steel, prestressing steel, and embedded items shall be accurately positioned in the forms and secured to prevent movement during concrete placement. Steel shall have a minimum concrete cover of 2-inches. Reinforcing steel details shall conform to ACI SP- 66. Welding of reinforcing steel shall be in accordance with AWS D1.4.

2.2.4 Concrete Mix

The concrete mix shall be selected by the Contractor to have a compressive strength of 5000 psi at 28 days (90 days if fly ash is used) and a slump of 1 to 3 inches. The water-cementitious materials ratio (by weight) shall be held to the minimum consistent with workability required for placement but in no case shall it exceed 0.45. Concrete shall be air entrained with a minimum of 4 percent and a maximum of 6 percent air entrainment, accomplished by use of an additive at the mixer. Nominal maximum size coarse aggregate shall be 1 inch. If pozzolan is used, it shall range from 15 to 30 percent by weight of the total cementitious materials. Once production begins, changes to the mix will not be permitted without written submittal and approval of the proposed changes.

2.2.5 Concrete Work

Concrete shall not be deposited in the forms until the placement of the reinforcement and anchorages has been inspected and approved by the Contracting Officer. Conveying equipment shall be cleaned thoroughly before each run and the concrete conveyed from the mixer to the forms as rapidly as practicable using methods that will not cause segregation or loss of ingredients. Concrete shall be deposited as nearly as practicable in its final position in the forms. At any point in conveying, the free vertical drop of the concrete shall not exceed 3 feet. Chuting will be permitted if the concrete is deposited into a hopper before being placed in the forms. Concrete that has segregated in conveying shall be removed. Each pile shall be produced of dense concrete with smooth surfaces. Each pile shall be a continuous pour until it is completed. Vibrator heads shall be smaller than the minimum distance between steel pretensioning. Side forms shall not be removed until concrete has attained 3500 psi compressive strength. Dimensional tolerances shall conform to PCI MNL-116. The ends of all piles and corners of square piles shall be chamfered 3/4 inch or, in lieu of chamfering, may be rounded to a 1-inch radius.

2.2.6 Pretensioning

Anchorage for tensioning the prestressing steel shall be an approved type. The tension to which the steel is to be pretensioned shall be measured by the elongation of the steel and also by the jack pressure reading on a gauge or by the use of an accurately calibrated dynamometer. The gauge or dynamometer shall have been calibrated by a calibration laboratory approved by the Contracting Officer within 12 months of commencing work and every 6 months thereafter during the term of the contract. Means shall be provided for measuring the elongation of the steel to the nearest 1/4 inch. The applied load determined from elongation measurements shall be computed using load-elongation curves for the steel used. When the difference between the results of measurement and gauge reading is more than 5 percent, the cause of the discrepancy shall be corrected. The tensioning steel shall be given a uniform prestress prior to being brought to design prestress. The same initial prestress shall be induced in each unit when several units of prestressing steel in a pile are stretched simultaneously.

2.2.7 Detensioning

Releasing of prestressing force in pretensioned piles shall be performed in a manner that minimizes eccentricity of prestress. Tension in the strands shall be released from the anchorage gradually. In no case shall the stress be released after casting without approval by the Contracting Officer. The transfer of prestressing force shall be done when the concrete has reached a compressive strength of not less than 4000 psi. The prestressing steel shall be cut or ground flush with the pile ends.

2.2.8 Curing of Piles

Piles shall be cured in accordance with the provisions contained in PCI MNL-116 except as follows. The maximum rate of heat gain shall not exceed 40 degrees Fahrenheit per hour and the maximum concrete temperature shall not exceed 165 degrees Fahrenheit during the curing cycle. Curing shall be continued until the concrete has attained a minimum compressive strength of 3500 psi as determined by the concrete test cylinders.

2.2.9 Splices

Splices will not be permitted.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

Testing during manufacture shall be performed by an approved commercial testing laboratory or by an approved laboratory maintained by the manufacturer of the material. Minimum requirements for testing during manufacture shall be as required in PCI MNL-116 except as modified herein.

2.3.1 Concrete Cylinders

A minimum of four standard 6-inch by 12-inch concrete test cylinders per casting bed shall be made to indicate transfer and 28-day strengths (90-day strength if pozzolan is used).

2.3.2 Testing by Government

Facilities shall be made available to the Contracting Officer for making and testing any additional test cylinders desired.

2.3.3 Certificates of Compliance

The Contractor shall certify that admixtures, aggregates, cement, and pozzolan used conform with the requirements of the specifications. Manufacturer's literature indicating conformance may be submitted for admixtures.

PART 3 EXECUTION

3.1 PILE DRIVING EQUIPMENT

The Contractor shall select the proposed pile driving equipment as specified and submit descriptions of the proposed equipment for approval. Equipment approval will be based on wave equation analysis and the engineering judgment of the Contracting Officer. Stresses predicted by wave equation analysis shall not exceed 0.85 times the concrete compressive strength minus the effective prestress in compression and the effective prestress in tension. Changes in the selected pile driving equipment will not be allowed after the equipment has been approved by the Contracting Officer

except as specified herein and directed by the Contracting Officer. No additional contract time will be allowed for Contractor proposed changes in the equipment.

3.1.1 Pile Driving Hammers

Pile driving hammers shall be of the impact type and capable of satisfying the requirement of paragraph 3.2.3.2. Hammers shall be steam, air, or diesel hammers of the single acting type. The size or capacity of hammers shall be as required for the pile type, weight, and soil formation to be penetrated. The rated energy of hammers shall be limited to a minimum of 23,000 foot-pounds and a maximum of 40,000 foot-pounds. Hammers shall be capable of, and so demonstrated during the development of refusal criteria, hard driving in excess of 10 blows per inch. Boiler, compressor, or engine capacity shall be sufficient to operate hammers continuously at the full rated speed so that a single-acting hammer obtains a full upward stroke of the ram. Single-acting hammers shall have a scale (in inches) fixed to the hammer's ram guide and a pointed indicator fixed on the ram to allow reading of the hammer's stroke. Both the scale and indicator shall be easily legible to observers on the ground. Hammers shall have a gage to monitor hammer bounce chamber pressure for diesel hammers or pressure at the hammer for air and steam hammers. This gage shall be operational during the driving of piles and shall be mounted in an accessible location for monitoring by the Contractor and the Contracting Officer. Two spare operational bounce chamber readout units shall be available on site. The Contractor shall provide bounce chamber pressure gage correction tables and charts for the type and length of hose to be used with the pressure gage to the Contracting Officer.

3.1.2 Pile Driving Leads

Leads shall align the pile and hammer concentrically, and maintain the pile in proper position and alignment throughout driving. Hammers shall be supported and guided with suspended leads, fixed extended leads or fixed underhung leads. For driving battered piles, hammers shall be supported and guided with fixed extended leads capable of achieving the batters shown on the plans three-axis, fixed extended leads capable of 1H and 2-1/2V fore and aft batter and 1H on 6V side batter, with 30 degree rotation each side of an axis running along the center line of rotation of the crane through the center line of the leads. The leads shall be of sufficient length to fully accommodate the combined length of the pile and hammer. Two intermediate pile supports shall be provided in the leads to reduce the unbraced length of the pile during driving and pulling.

3.1.3 Driving Helmets and Pile Cushions

A driving helmet including a pile cushion shall be used between the top of the pile and the ram to prevent impact damage to the pile. The driving helmet and pile cushion combination shall be capable of protecting the head of the pile, minimize energy absorption and dissipation, transmit hammer energy uniformly over the top of the pile and prevent excessive tensile stresses from developing in the concrete during driving.

The driving helmet shall fit loosely around the top of the pile so that the pile is not restrained by the helmet if the pile tends to rotate during driving. The pile cushion may be of solid wood or of laminated construction, completely cover the top surface of the pile, and be retained by the driving helmet. Minimum thickness of the pile cushion shall be 3 inches and the thickness shall be increased so as to be suitable for the size and length of pile, character of subsurface material to be encountered, hammer characteristics, and the required driving resistance.

3.1.4 Cap Blocks

The cap block (hammer cushion) used between the driving cap and the hammer ram may be of solid hardwood block with grain parallel to the pile axis and enclosed in a close-fitting steel housing or may consist of aluminum and approved industrial type plastic laminate disks stacked alternately in a steel housing. Steel plates shall be used at the top and the bottom of the cap block. The cap block shall be replaced if it has been damaged, highly compressed, charred, or burned or has become spongy or deteriorated in any manner. If a wood cap block is used, it shall not be replaced during the final driving of any pile. Under no circumstances will the use of small wood blocks, wood chips, rope, or other material permitting excessive loss of hammer energy be permitted.

3.1.5 Pile Extractors

Impact hammers are required for pulling piles.

3.2 INSTALLATION

3.2.1 Lengths of Permanent Piles

The lengths of piles required are indicated on the drawings.

3.2.2 Pile Placement and Tolerances

Foundation preparation (removal of unsuitable material and densification of foundation fill) shall be completed in an area prior to driving permanent piles within that area. A pile placement plan shall be developed to show the installation sequence and the methods proposed for controlling the location and alignment of piles and submitted for approval. Piles shall be placed accurately in the correct location and alignments, both laterally and longitudinally, and to the vertical or batter lines indicated. The Contractor shall establish a permanent baseline during pile driving operations to provide for inspection of pile placement by the Contracting Officer. The baseline shall be established prior to driving permanent piles and shall be maintained during the installation of the permanent piles. Prior to driving and with the pile head seated in the hammer, the Contractor shall check each pile for correct alignment. The alignment of battered piles shall be checked and monitored during driving with an

accurate batter board level and surveying instrument. A final lateral deviation from the correct location at the cutoff elevation of not more than 3 inches will be permitted.

A vertical deviation from the correct cutoff elevations shown on the drawing of not more than 2 inches will be permitted. A final variation in slope of not more than 1/4 inch per foot of longitudinal axis will be permitted. The correct relative position of all piles shall be maintained by the use of templates or by other approved means. Piles not located properly or exceeding the maximum limits shown above, lateral deviation, and/or variation in alignment shall be pulled and redriven at a directed location.

3.2.3 Pile Driving

Piles shall not be driven within 100 feet of concrete less than 7 days old nor within 30 feet of concrete less than 28 days old unless otherwise authorized. Driving shall not result in cracking, crushing, or spalling of concrete. The sequence of installation shall be such that pile heave is minimized. Where heave is anticipated, pile driving shall start at the center of the group and proceed outward and vertical piles shall be driven prior to those battered where practicable. The Contracting Officer shall be notified 30 days prior to the date driving is to begin.

3.2.3.1 Driving Records

The Contractor shall develop a form for recording the pile driving operations, obtain approval of this form, and compile complete records of the operations. Pile driving records shall include pile dimensions and location, pile identification number, casting date, date driven, original pile length, cutoff and tip elevations, batter alignment, description of hammer used, rated hammer energy, observed stroke and rate of hammer operation (blows per minute), air or steam pressure at the hammer or bounce chamber pressure, length of pressure hose, penetration under the combined weight of the pile and hammer, number of blows required for each foot of penetration throughout the entire length of each pile and for each inch of penetration in the last foot of penetration, time for start and finish of driving, total driving time in minutes and seconds for each pile, cushion information including changes during driving, and any other information as required or requested. Record shall also include information such as unusual driving conditions, interruptions or delays during driving, observed pile damage, heave detected in adjacent piles, records of restriking, depth and description of voids formed adjacent to the pile, and any other pertinent information.

3.2.3.2 Penetration Criteria

Piles shall be driven to the required depth of penetration as shown on the drawings or until the maximum permissible blow count is exceeded. The maximum permissible blow count shall be limited to 10 blows per inch, for the last 12 inches of penetration or established from wave equation analyses so that stresses in the pile are limited to 0 psi in tension and 0.85 times the compressive strength in compression.

3.2.3.3 Driving

Once pile driving has begun, conditions such as alignment and batter shall be kept constant. Each pile shall be driven continuously and without interruption until the required penetration criteria has been attained. Deviation from this procedure will be permitted only for necessary changes to the pile cushion or whenever driving is stopped by causes that reasonably could not have been anticipated. Pile cushion changes will be considered necessary whenever the cushion has become highly compressed, charred, burned, or deteriorated. Changes to the cushion will not be allowed near the end of driving. A pile that cannot be driven to the required depth because of an obstruction, as indicated by a sudden unexplained change in blow count and drifting, shall be pulled and redriven or shall be cut off and abandoned, whichever is directed.

A pile, which cannot be driven to the required tip elevation because the maximum permissible blow count is exceeded shall be reported to the Contracting Officer. The Contracting Officer will direct the Contractor to cut off the pile, pull and redrive the pile, or perform other corrective measures. Corrective measures may consist of adding a pile at an adjacent location.

3.2.3.4 Heaved Piles

When driving piles in clusters or under conditions of relatively close spacing, observations shall be made to detect heave of adjacent piles. Heaved piles shall be restruck sufficiently to relieve soil setup and driven to the original penetration criteria.

3.2.3.5 Pulled Piles

Piles damaged or impaired for use during driving shall be pulled and replaced with new piles, or shall be cut off and abandoned and new piles driven as directed. The Contracting Officer may require that any pile be pulled for inspection. Piles pulled at the direction of the Contracting Officer and found to be in suitable condition shall be redriven at a directed location.

3.2.3.6 Jetting

Jetting of piles will not be permitted.

3.2.3.7 Void Backfill

Voids occurring around piles as a result of pile driving and abandoned holes for piles that have been pulled shall be filled to within 3 feet of the adjacent ground surface with a thick tremie-placed slurry (from bottom to top of hole). The slurry shall consist of one part Portland cement, two parts bentonite, and six parts sand mixed with enough water to produce a slurry viscous enough to thoroughly fill the voids, but having no less than 12 pounds of solids per gallon. The upper 3 feet of the void shall be earth filled and compacted to the same density as the surrounding soil.

3.2.4 Cutting of Piles

The proposed method for cutting of piles for removal of driving heads must be approved and shall not damage the pile concrete or reinforcement steel left in place. The use of explosives will not be permitted. Driving heads shall not be removed until heaved piles are redriven to the original penetration criteria. Cut off sections of piles shall be removed from the site upon completion of the work.

3.2.5 Splicing

Splicing of driven piles will not be permitted.

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SECTION 02731 – SURFACING, CRUSHED STONE

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor and materials and performing all work necessary to maintain surfacing for the existing access road from Airline Highway to the existing flood protection, construct and maintain surfacing of access roads to the Almedia and Walker Canal/Parish Line Drainage Structures from the existing access road, construct and maintain floodside access roads and ramps, and maintain the ramp over the Bonnet Carre' Spillway Upper Guide Levee.

1.2 REFERENCES

The following publications form a part of this specification to the extent indicated by the references thereto.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 131	(2001) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
D 75	(1997) Sampling Aggregates
D 3740	(2001) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT, TESTING PROCEDURES MANUAL (TPM), VOLUMES 1 AND 2.

TR 112-99 Amount of Material Finer than No. 200 Sieve in Aggregate

TR 113-99 Sieve Analysis of Fine and Coarse Aggregates

TR 428-67 Determining the Atterberg Limits of Soils

1.3 MEASUREMENT

1.3.1 Access Roads and Ramps

Surfacing material required for the access roads and ramps shown on the drawings including their maintenance shall be measured by the cubic yard satisfactorily placed.

1.3.1.1 Vehicle Delivery

Measurement will be made by the cubic yard in approved vehicles at the site of the work. Allowance will not be made for wastage or shrinkage during transportation from car or other point of loading. Approved vehicles for this purpose may be of any type acceptable to the Contracting Officer. The body shall be that of any shape that the actual delivered contents may be readily and accurately determined and will remain constant. Unless all approved vehicles for the work are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its approved capacity.

The Government may reject all loads hauled in non-approved vehicles. Upon delivery of each load at the jobsite and prior to the Contractor's measurement of each load, the Contractor shall "level-off" each load within the approved vehicles so that an accurate measurement of each load can be made. After leveling off the load, the Contractor's Quality Control personnel shall measure each load at the site of work. The Government will inspect each load, check its yardage and witness the Contractor's measurement of each load.

1.3.1.2 Shaping and Maintenance

No measurement will be made for shaping and maintenance operations.

1.4 PAYMENT

1.4.1 Access Roads and Ramps

Payment for the surfacing material required for the new access roads and ramps at each drainage structure, as shown on the drawings, and the existing 30-foot wide access road from Airline Highway including the maintenance of the access roads and ramps will be made at the contract unit price per cubic yard satisfactorily placed for "Surfacing, Crushed Stone" for each drainage structure. The costs for maintaining the ramp across the Bonnet Carre' Spillway Upper Guide Levee and the existing 30-foot wide access road from Airline Highway shall be split equally between the two drainage structures and included in the cost for the surfacing materials. Price and payment shall constitute full compensation for subgrade preparation; furnishing all plant, labor, equipment, and materials; placing, spreading, compacting, and maintenance, including any required shaping, as shown on the drawings and specified herein.

1.4.2 Shaping and Maintenance

No separate payment will be made for the shaping and maintenance of the all access roads, all ramps and corresponding surfacing material; and all costs in connection therewith shall be included in the applicable contract price for the items to which the work pertains (i.e. surfacing, embankment, etc.).

1.5 QUALITY CONTROL

1.5.1 General

The Contractor shall establish and maintain quality control for the surfacing operations to assure compliance with contract specifications and drawings and maintain records of its quality control for all construction operations including, but not limited to, compliance with surfacing standards, quality and gradation of surfacing, thickness of surfacing prior to compaction, and width and location of the roadway in relation to the centerline of the new access road.

1.5.2 Reporting

The original and two copies of these records, as well as the records of corrective action taken, shall be furnished the Government daily. Format of the report shall be as prescribed in Section 01451, "CONTRACTOR QUALITY CONTROL".

1.5.3 Sampling and Testing

Sampling and testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by an approved commercial testing laboratory or by the Contractor, subject to approval. If the Contractor elects to establish its own testing facilities, approval of such facilities will be based on compliance with ASTM D 3740. No work requiring testing will be permitted until the Contractor's facilities have been inspected and approved.

1.5.3.1 Sampling

Sampling of material shall be performed in conformance with ASTM D 75. Sampling will be observed by the COR.

1.5.3.2 Testing

Testing of surfacing materials shall be performed at a minimum frequency of one set of tests per 2500 cubic yards or fraction thereof of surfacing material placed. Testing of surfacing materials shall include gradation and Atterberg testing as indicated in paragraphs 2.1.1 and 2.1.2. Test performance shall be pursued in such a manner that the results are obtained in the minimum time frame. All test results shall be furnished to the COR to confirm materials compliance with the specifications.

Surfacing materials not meeting the specifications shall be removed from the site and replaced with surfacing materials meeting the specifications.

1.6 SUBMITTALS

1.6.1 General

The Contractor shall submit the following items in accordance with the requirements of Section 01330, "SUBMITTAL PROCEDURES".

1.6.2 Tests, Reports and Gradation Curves

The Contractor shall submit certified quality and gradation test results of surfacing material to the Contracting Officer's Representative (COR) for approval prior to shipment, including all certificates, tests, reports and gradation curves required in paragraphs 2.1.1, 2.1.2 and 2.2.

1.6.3 Maintenance Plan

The Contractor shall submit a maintenance plan stating what equipment will be used to maintain the access roads and ramps, location of the equipment, and what procedures will be utilized to maintain the access and haul roads. The roads and ramps shall be kept in good condition through out the entire contract. The equipment shall be kept readily available for use at the construction site and borrow areas. All hauling or vehicle operations on any affected access roads and ramps will cease if in the opinion of the Contracting Officer's Representative (COR), the access road and/or ramps has become rutted or damaged and is in need of grading or repair to continue hauling operations. The plan will be submitted to the Contracting Officer's Representative for approval prior to placement of any surfacing.

PART 2 PRODUCTS

2.1 SURFACING

Surfacing material shall be one of the following:

2.1.1 Crushed Stone

Crushed stone from the sources listed in the General Provision clause entitled "STONE SOURCES" shall consist of 100% stone and shall meet the following requirements when tested in accordance with DOTD TR 112 and TR 113:

<u>U.S. Sieve</u>	<u>Percent Passing</u>
1-1/2"	100
3/4"	50-100
No. 4	35-65

No. 40
No. 200

10-32
3-15

The fraction of material passing the No. 40 sieve shall conform to the following requirements when tested in accordance with DOTD TR 428:

Plasticity Index (PI)	4 (Max.)
Liquid Limit (LL)	25 (Max.)

Crushed stone shall show an abrasion loss of not more than 40 percent when tested in accordance with ASTM C 131 and a soundness loss of not more than 15 percent when tested in accordance with ASTM C 88.

2.1.2 Recycled Portland Cement Concrete

Recycled Portland cement concrete shall consist of 100 percent crushed Portland cement concrete and will be permitted in combination with other approved stone for surface course. This material or a combination thereof shall conform to the gradation requirements as specified in paragraph 2.1.1. Recycled Portland cement concrete shall show an abrasion loss of not more than 40 percent when tested in accordance with ASTM C 131 and a soundness loss of not more than 15 percent when subjected to 5 cycles of the magnesium sulfate soundness test in accordance with ASTM C 88.

2.2 TESTING

Testing of surfacing materials shall include gradation and Atterberg Limit Testing for crushed stone, or gradation testing for crushed concrete in accordance with LDOTD Designations TR 112, TR 113 and TR 428. Testing of surfacing materials shall be performed at a minimum frequency of one set of tests per 2500 cubic yards or fraction thereof of surfacing material placed. In addition, test results of surfacing materials to be utilized shall be furnished for approval by the Contracting Officer's Representative (COR) prior to initial placement of surfacing materials. Subsequent samples to be tested shall be witnessed by the COR as being representative of the surfacing materials being placed. All test results shall be furnished to the COR to confirm materials compliance with the specifications. Surfacing materials not meeting the specifications shall be removed from the site and replaced with surfacing materials meeting the specifications. Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor. Test performance shall be pursued in such a manner that the results are obtained in the minimum time frame.

PART 3 EXECUTION

3.1 BASE PREPARATION

Prior to placement of the surfacing, all debris shall be removed from the area to receive the surfacing. Base preparation for the entire access road shall be completed in advance of placing surfacing.

3.2 PLACEMENT AND COMPACTION

3.2.1 New Access Road and Ramps

The placement and compaction of surfacing on the new access roads and ramps shall not commence until all clearing, grubbing, hauling and compaction operations for the access road and ramps base have been completed, including final dressing of the access road and ramp.

3.2.2 Placement and Compaction

No surfacing shall be placed or compacted on a muddy or rutted subgrade. The surfacing material shall be compacted to provide a smooth, uniform, closely-knit riding surface free from ridges and depressions. The final surfaced area shall have a thickness of 9-inches compacted crushed stone or recycled PCC. Compaction shall be performed by making two or more passes with a rubber-tired roller. The rubber tired roller used for the compaction shall be as described in paragraph 3.2.4.

3.2.3 Shaping

The surface course shall be shaped by the use of a blade grader or other suitable means. Any ruts formed shall be shaped as often as necessary to prevent breaking through the surfacing material into the subgrade. Holes, waves, and deficiencies in thickness which may develop and are not filled by shaping, shall be filled by adding more material. Shaping shall continue until the surface is free from ruts, waves, and undulations.

3.2.4 Rollers

The minimum requirements for rubber-tired rollers to be used for compaction will be a 10-ton, 11-wheel, 7.50 x 15 tires, towed type, tandem pneumatic-tired roller. All rollers shall be towed at speeds not to exceed 5 miles per hour.

3.3 MAINTENANCE

3.3.1 New Access Roads and Ramps

Access road and ramp surfacing shall be maintained by such shaping. No additional payment will be made for shaping and maintenance operations. Any damage to the access roads and ramps by the Contractor's construction operations shall be repaired by the Contractor at no expense to the Government, except surfacing material shall be

added as directed by the Contracting Officer to provide a usable and drivable road during the construction period and at the end of the contract.

3.3.2 Existing Access Road

Initial maintenance of surfacing for the existing 30-foot wide access road from Airline Highway to the temporary truck wash rack and the toe of existing flood protection levee shall be completed prior to initiation of hauling operations from the clay borrow area in the Bonnet Carre' Spillway and prior to initiation of clearing and grubbing operations for the new flood protection levees and structures. The initial maintenance shall include placement and compaction of 3 inches of surfacing on the existing access road/surfacing. All surfacing shall be maintained by shaping. No additional payment will be made for shaping and maintenance operations. Any damage to the 30-foot wide access road by the Contractor's construction operations shall be repaired by the Contractor at no expense to the Government, except surfacing material shall be added as directed by the Contracting Officer to provide a usable and drivable road during the construction period.

3.3.3 Bonnet Carre' Upper Guide Levee Access Ramp

The existing access ramp over the Bonnet Carre' Spillway Upper Guide Levee shall be maintained by such shaping as directed by the Contracting Officer to provide a usable and drivable road under all weather conditions. No additional measurement and payment will be made for this maintenance and shaping. All costs for the shaping and maintenance for existing access ramp over the Bonnet Carre' Spillway Upper Guide Levee shall be paid for as stated in paragraph 1.4.1 and 1.4.2.

3.3.4 Placement, Compaction and Shaping

Shaping, placement and compaction of any surfacing placed for maintenance shall be performed as stated in paragraphs 3.2.2 and 3.2.3.

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SECTION 03301 - CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, materials, equipment, and performing all operations necessary for batching, transporting, placing and finishing cast-in-place concrete for the inverted T-walls, and the drainage structures at Almedia and Walker Canal/Parish line locations and all other incidental work specified herein or as shown on the drawings. The following related work specified elsewhere.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Formwork for Concrete, Section 03101

Expansion Joints and Water Stops, Section 03150

Reinforcing Steel, Section 03210

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

- | | |
|----------|---|
| 211.1 | (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete |
| 305R | (1991) Hot Weather Concreting |
| 318/318R | (1995) Building Code Requirements for Reinforced Concrete |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------|---|
| C 29 | (1997) Bulk Density ("Unit Weight") and Voids in Aggregate |
| C 31 | (1998) Making and Curing Concrete Test Specimens in the Field |
| C 33 | (1999a) Concrete Aggregates |

C 39	(1999) Compressive Strength of Cylindrical Concrete Specimens
C 42	(1999) Obtaining and Testing Drilled Cores and Sawed Beam of Concrete
C 70	(1994) Surface Moisture of Fine Aggregate
C 94	(2000) Ready-Mixed Concrete
C 127	(1988) Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregates
C 128	(1997) Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregates
C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
C 143	(1998) Slump of Hydraulic Cement Concrete
C 150	(2000) Portland Cement
C 171	(1997a) Sheet Materials for Curing Concrete
C 172	(1999) Sampling Freshly Mixed Concrete
C 192	(1998) Making and Curing Concrete Test Specimens in the Laboratory
C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
C 260	(2000) Air-Entraining Admixtures for Concrete
C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
C 494	(1999a) Chemical Admixtures for Concrete
C 566	(1997) Total Moisture Content of Aggregate by Drying
C 595	(2000) Blended Hydraulic Cement

C 597	(1997) Pulse Velocity Through Concrete
C 618	(2001) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 803	(1997) Penetration Resistance of Hardened Concrete
C 805	(1997) Rebound Number of Hardened Concrete
C 989	(1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
C 1017	(1999) Chemical Admixtures for Use in Producing Flowing Concrete
C 1059	(1999) Latex Agents for Bonding Fresh to Hardened Concrete
C 1064	(1999) Temperature of Freshly Mixed Portland Cement Concrete
C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
D 75	(1997) Sampling Aggregates

CORPS OF ENGINEERS (CE)

CRD-C 94-95	Surface Retarders
CRD-C 100-75	Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
CRD-C 104-80	Calculation of the Fineness Modulus of Aggregate
CRD-C 112-69	Surface Moisture in Aggregate by Water Displacement
CRD-C 143-62	Meters for Automatic Indication of Moisture in Fine Aggregate
CRD-C 318-72	Cloth, Burlap, Jute (or Kenaf)
CRD-C 400-63	Water for Use in Mixing or Curing Concrete

CRD-C 521-81 Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44-00 Specifications, Tolerances, and Other Technical
Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100-90 Concrete Plant Standards

LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES
(LSSRB) 2000 EDITION, STATE OF LOUISIANA, DEPARTMENT OF
TRANSPORTATION AND DEVELOPMENT (LDOTD)

805.13 Concrete Surface Finishes

1003.02 Aggregates for Portland Cement Concrete and Mortar

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CCC-C-467C (8 Feb. 72) Cloth, Burlap, Jute

1.4 MEASUREMENT AND PAYMENT

No measurement will be made for cast-in-place concrete specified herein above. Payment for concrete at each structure shall be made at the applicable contract lump sum price for : "Concrete - Stabilization Slab", "Reinforced Concrete - Drainage Structure" or "Reinforced Concrete -T-walls & Wingwalls". Price and payment shall include the costs of all labor, materials, and the use of all equipment and tools required to complete the concrete work, including steel reinforcement, formwork, and all other items incidental thereto.

1.5 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

1.5.1 Concrete Mixture Proportioning; GA

Concrete mixture proportions shall be determined by the Contractor, in accordance with the requirements in paragraph 2.2, and submitted for approval. The concrete

mixture quantities of all ingredients per cubic yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the weight of cement, pozzolan and ground granulated blast-furnace (GGBF) slag when used, and water; and weights of aggregates in a saturated surface-dry condition; and the quantities of admixtures. The submission shall be accompanied by test reports from a laboratory complying with ASTM C 1077, which show that proportions thus selected will produce concrete of the qualities indicated. The submission shall provide information specified in paragraph 2.2.9, and if applicable, paragraph 2.2.7. Concrete compression strength results submitted shall include specific gravity and absorption of fine and coarse aggregates determined by ASTM C 128 and ASTM C 127, respectively; slump and air content. Test reports shall be from tests performed on concrete produced from the submitted mixture proportions. No substitution shall be made in the source or type of materials used in the work without additional tests to show that the quality of the new materials and concrete are satisfactory.

1.5.2 Batch Plant; FIO

Details of the data on concrete plant shall be submitted for review by the Contracting Officer for conformance with paragraphs 3.1.1 and 3.1.2.

1.5.3 Concrete Mixers; FIO

The make, type, and capacity of concrete mixers proposed for mixing concrete shall be submitted for review by the Contracting Officer for conformance with paragraphs 3.1.1 and 3.1.3.

1.5.4 Conveying Equipment and Methods; FIO

A description of the methods and equipment for transporting, handling, and depositing the concrete shall be submitted for review by the Contracting Officer for conformance with paragraphs 3.1.1 and 3.1.4.

1.5.5 Placing Equipment and Methods; FIO

A description of all placing equipment and methods shall be submitted for review by the Contracting Officer for conformance with paragraphs 3.1.1 and 3.3.

1.5.6 Testing Technicians; FIO. Concrete Construction Inspector; FIO

The Contractor shall submit statements that the concrete testing technicians and the concrete inspectors meet the requirements of paragraph 3.7.

1.5.7 Construction Joint Treatment; GA

A description of the methods and equipment proposed for joint cleanup and waste disposal shall be submitted for review by the Contracting Officer for conformance with paragraph 3.2.4.

1.5.8 Curing and Protection; GA

A description of the curing media, equipment and methods to be used shall be submitted for review by the Contracting Officer for conformance with paragraph 3.5.

1.5.9 Cold-Weather Placing; GA

If concrete is to be placed under cold-weather conditions, a description of the proposed materials, methods, and protection shall be submitted for approval by the Contracting Officer for conformance with paragraphs 3.3.4 and 3.4.

1.5.10 Hot-Weather Placing; GA

If concrete is to be placed under hot-weather conditions, a description of the proposed materials and methods meeting the shall be submitted for approval by the Contracting Officer for conformance with requirements of paragraphs 3.3.5 and 3.4.

1.5.11 Aggregate ; GA

Information identifying the aggregate source to be used along with gradation tests for fine and coarse aggregates shall be submitted for approval. The gradation test for fine aggregate shall include the No. 8 and No. 30 sieve sizes. Specific gravity and absorption of fine and coarse aggregates determined by ASTM C 128 and ASTM C 127, respectively shall also be submitted.

1.5.12 Uniformity of Concrete Mixing; FIO

The results of the initial mixer uniformity tests as required in paragraph 3.7.2.13 shall be submitted at least 5 days prior to the initiation of placing. The initial test results submitted shall not be more than three months old. Additional tests results shall be submitted six months from the date of the initial tests then thereafter in accordance with the time frame specified in paragraph 3.7.2.13.

1.5.13 Tests and Inspections; FIO

Test results and inspection reports shall be submitted daily and weekly as required in paragraph 3.7.3.

1.5.14 Cementitious Materials; GA

Cementitious Materials, including Cement and Pozzolan, and Ground Granulated Blast-Furnace Slag will be accepted on the basis of the manufacturer's certification of

compliance, accompanied by mill test reports that materials meet the requirements of the specification under which they are furnished. Certification and mill test reports shall be from samples taken from the particular lot furnished. No cementitious materials shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious materials will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. Material not meeting specifications shall be promptly removed from the site of work.

1.5.15 Impervious-Sheet Curing Materials; FIO

Impervious-Sheet Curing Materials shall be certified for compliance with all specification requirements.

1.5.16 Air-Entraining Admixture; FIO

Air-Entraining Admixture shall be certified for compliance with all specification requirements.

1.5.17 Other Chemical Admixtures; FIO

Other Chemical Admixtures shall be certified for compliance with all specification requirements.

1.5.18 Membrane-Forming Curing Compound; FIO

Membrane-Forming Curing Compound shall be certified for compliance with all specification requirements.

1.5.19 Latex Bonding Compound; FIO

Latex Bonding Compound shall be certified for compliance with all specification requirements.

1.5.20 Nonshrink Grout; FIO

Descriptive literature of the Nonshrink Grout proposed for use shall be furnished together with a certificate from the manufacturer stating that it is suitable for the application or exposure for which it is being considered.

1.5.21 Water; FIO

The name of the source of mixing and curing water (and documentation that mixing water meets CRD-C 400, if undrinkable) shall be submitted for conformance with paragraph 2.1.5 below.

1.6 GOVERNMENT TESTING AND SAMPLING

The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples of aggregates and concrete. Concrete and aggregate testing requirements in this section do not relieve the Contractor of the requirements outlined in paragraph 3.7.

1.6.1 Aggregates

The aggregate sources listed in 01100-12 have been tested and at the time testing was performed, these sources were capable of producing materials of a quality acceptable for this project provided suitable processing was performed. If the Contractor proposes to furnish aggregates from a source not listed in 01100-12, samples consisting of not less than 500 pounds of each size coarse aggregate and 300 pounds of fine aggregate taken under the supervision of the Contracting Officer in accordance with CRD-C 100 shall be delivered to the Waterways Experiment Station (3909 Halls Ferry Road) in Vicksburg, MS, within 15 days after notice to proceed. Sampling and shipment of samples shall be at the Contractor's expense. The cost of testing one source for each size aggregate will be borne by the Government. If the Contractor selects more than one source for each aggregate size or selects a substitute source for any size aggregate after the original source was tested, the cost of that additional testing will be borne by the Contractor. From 90 to 120 days will be required to complete evaluation of the aggregates. Testing will be in accordance with applicable CRD or ASTM test methods. Tests to which aggregate may be subjected are specific gravity, absorption, cycles of freezing and thawing in concrete, alkali-aggregate reaction, organic impurities, and any other test necessary to demonstrate that the aggregate is of a quality that is at least equivalent to those sources listed in 01100-12.

1.6.2 Concrete

The Government will determine when concrete shall be sampled. The Contractor shall cast, protect and deliver concrete cylinders and determine slump and air content. The person conducting the tests shall meet the Concrete Field Testing Technician requirements contained in paragraph 3.7.1. Concrete shall be sampled in accordance with ASTM C 172. When cylinders are molded, slump and air content shall be determined in accordance with ASTM C143 and ASTM C 231, respectively. Test samples for each class of concrete shall be taken at least once every 8-hour shift or for every 150 cubic yards placed, whichever requires more samples. From each sample, three 6-inch by 12-inch compression test specimens shall be made in accordance with ASTM C 31. Compression test specimens shall be protected and cured while in the field in accordance with paragraphs 9.1 and 9.2 of ASTM C 31. If cylinders are not delivered to the testing laboratory within 24

to 48 hours after molding, they shall be submerged in a water tank provided by the Contractor, where the surrounding water temperature is maintained by the Contractor at 73.4 plus or minus 3 degrees F. Cylinders shall be transported in accordance with ASTM C 31 (with cushioning material) and unloaded in the Government designated location. Compression testing will be performed by the Government in accordance with ASTM C 39. One cylinder will be tested at 7 days for information and two cylinders will be tested at 28 days (90 if pozzolan or slag is used) for acceptance.

1.6.3 Concrete Strength

Compressive strength test specimens required in paragraph 1.6.2 will be used to determine compliance. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'_c and no individual test result falls below the specified strength f'_c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including nondestructive testing, taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

1.6.3.1 Investigation of Low-Strength Test Results

When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803, or ASTM C 805 may be permitted by the Contracting Officer to estimate the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests shall not be used as a basis for acceptance or rejection.

1.6.3.2 Testing of Cores

When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the performance of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement.

1.6.3.3 Load Tests

If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies will be performed and approved by the Contracting Officer at the expense of the Contractor, except that if all concrete is in compliance with the plans and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.7 DESIGN REQUIREMENTS

1.7.1 General

Locations of concrete are described below

DESIGNATION	ELEMENTS
Drainage Structure	All concrete used to create drainage structure including base slab, walls, beams and roofs/floors
T-walls & Wingwalls	Slab and stems of inverted T-walls
Stabilization Slabs	Stabilization slabs

1.7.2 Concrete Strength

Specified compressive strength f'_c shall be as follows:

Compressive Strength (PSI)	Structure Or Portion Of Structure
4,000 @ 28 days*	Drainage Structure
4,000 @ 28 days*	T-Walls and Wingwalls
2,500 @ 28 days*	Stabilization Slab

* 90 days if pozzolan or slag is used

1.7.3 Maximum Water-Cementitious Materials (W/CM) Ratio

W/CM, By Mass	Structure Or Portion Of Structure
0.45	Drainage Structure, T-Walls and Wingwalls
0.64	Stabilization Slab

1.8 CONSTRUCTION TOLERANCES

1.8.1 General

The definitions of the terms used in the following tables shall be as defined in ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing. When forms or shoring are used, the measurements shall be made prior to removal. Tolerances are not cumulative. The most restrictive tolerance controls. Tolerances shall not extend the structure beyond legal boundaries. Except as specified otherwise, plus tolerance increases the amount or dimension to which it applies, or raises a level alignment, and minus tolerance decreases the amount or dimension to which it applied, or lowers a level alignment. A tolerance without sign means plus or minus. Variation in alignment, grade, and dimensions of the structures from the established alignment, grade, and dimensions shown on the drawings shall be within the tolerances specified in the following table:

TABLE 1

CONSTRUCTION TOLERANCES FOR REINFORCED CONCRETE STRUCTURES

(1) Variations from the plumb:	In any 10 feet of length.... 1/4 inch
a. In the lines and surfaces of columns, piers, and walls	Maximum for entire length... 1 inch
b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any 20 feet of length.... 1/4 inch Maximum for entire length... 1/2 inch
2) Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length.... 5/16 inch In any bay or in any 20 feet of length..... 3/8 inch
a. In exposed horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length of length..... 1/4 inch Maximum for entire length... 1/2-inch
3) Variation in the sizes and locations of sleeves, floor openings, and wall openings	Minus..... 1/4 inch Plus..... 1/2 inch
4) Variations in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus..... 1/4 inch Plus..... 1/2 inch

5) Footings:

- a. Variation of dimensions when formed or plus 3-inches when placed against unformed excavation. Minus..... 1/2 inch
Plus..... 2 inches
- b. 2 percent of the footing width in the direction of misplacement but not more than..... 2 inches
- c. Reduction in thickness of specified thickness Minus..... 5 percent

1.8.1.1 Level and Grade Tolerance

Level and Grade Tolerance Measurements for Slabs shall be made as soon as possible after finishing. When forms or shoring is used, the measurements shall be made prior to removal.

1.8.2 Surface Requirements

The surface requirements for the classes of finish required in 03101-2.1.1 shall be as hereinafter specified. Allowable irregularities are designated "abrupt" or "gradual" for purposes of providing for surface variations. Offsets resulting from displaced, misplaced, or mismatched forms, or sheathing, or by loose knots in sheathing, or other similar form defects, shall be considered "abrupt" irregularities. Irregularities resulting from warping, unplaneness, or similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities. "Gradual" irregularities will be checked for compliance with the prescribed limits with a 5-ft template, consisting of a straightedge for plane surfaces and a shaped template for curved or warped surfaces. In measuring irregularities, the straightedge or template may be placed anywhere on the surface in any direction, with the testing edge held parallel to the intended surface.

<u>Class of Finish</u>	<u>Irregularities (Maximum Allowed)</u>	
	<u>Abrupt, inches</u>	<u>Gradual, inches</u>
A	1/8	1/4
D	1	1

1.8.3 Appearance

Permanently exposed surfaces shall be cleaned, if stained or otherwise discolored, by a method that does not harm the concrete and that is approved by the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall be portland cement, portland-pozzolan cement, or, portland cement in combination with pozzolan or ground granulated blast-furnace (GGBF) slag and shall conform to appropriate specifications listed below. Use for architectural concrete shall be restricted to one color, one source, and one type.

2.1.1.1 Portland Cement

ASTM C 150, Type I or II, low alkali, except that the maximum amount of C_3A in Type I cement shall be 15 percent and cement with a Blain Fineness of 400 square meters per kilogram shall be considered Type III cement.

2.1.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III, low alkali used only when specifically approved in writing.

2.1.1.3 Pozzolan.

Pozzolan shall conform to ASTM C 618, Class C or F, with the Multiple Factor and the Effectiveness in Controlling Alkali-Silica Reaction requirements of Table 3.

2.1.1.4 Ground Granulated Blast-Furnace Slag

Ground Granulated Blast-Furnace Slag shall conform to ASTM C 989, Grade 120.

2.1.1.5 Reserved

2.1.1.6 Portland-Pozzolan Cement

Portland-pozzolan cement shall conform to ASTM C 595, Type IP with Table 2 mortar expansion limits.

2.1.2 Aggregates

Concrete aggregate shall be produced from the sources in Section 01100, paragraph Concrete Aggregate Sources. Fine and coarse aggregates shall conform to the grading requirements of ASTM C 33 or LSSRB 1003.02. The quality of all aggregates shall conform to ASTM C 33. The nominal maximum size shall be as listed in paragraph 2.2.2.

2.1.3 Chemical Admixtures

Chemical admixtures to be used, when required or permitted, shall conform to the appropriate specification listed.

2.1.3.1 Air-Entraining Admixture

The air-entraining admixture shall conform to ASTM C 260 and shall consistently cause the concrete to have an air content in the specified ranges under field conditions.

2.1.3.2 Reserved

2.1.3.3 Water-Reducing or Retarding Admixture

Water-Reducing or Retarding Admixtures: ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive strength tests are waived.

2.1.3.4 Admixture High-Range Water Reducer

High-Range Water Reducing Admixture: ASTM C 494, Type F or G, except that the 6-month and 1-year compressive strength tests are waived. The admixture may be used only when approved by the Contracting Officer, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan.

2.1.4 Curing Materials

2.1.4.1 Impervious-Sheet Curing Materials

Impervious-sheet curing materials shall conform to ASTM C 171, type optional, except polyethylene film shall not be used.

2.1.4.2 Membrane-Forming Curing Compound

The membrane-forming curing compound shall conform to ASTM C 309, Type 1-D or 2, Class B.

2.1.4.3 Burlap

Burlap used for curing shall conform to GSA CCC-C-467C.

2.1.5 Water

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, sugar, or alkali, except that nonpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.6 Nonshrink Grout

Nonshrink grout shall conform to ASTM C 1107 and shall be a commercial formulation suitable for the application proposed.

2.1.7 Reserved

2.1.8 Latex Bonding Compound

Latex bonding compound agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.2 CONCRETE MIXTURE PROPORTIONING

2.2.1 Quality and Location of Mixture

For each portion of the structure, mixture proportions shall be selected so that the strength and W/CM requirements listed in paragraph 1.7 are met.

2.2.2 Nominal Maximum-Size Coarse Aggregate

Nominal maximum-size coarse aggregate shall be 1-1/2 inches or 1 inch except 3/4 inch nominal maximum-size coarse aggregate shall be used when any of the following conditions exist: the narrowest dimension between sides of forms is less than 7-1/2 inches; the depth of the slab is less than 4 inches; the minimum clear spacing between reinforcing and sheet piling is less than 2-1/4 inches; or minimum clear spacing between reinforcing is less than 2-1/4 inches.

2.2.3 Air Content

Air content as delivered to the forms and as determined by ASTM C 231 shall be between 4 and 7 percent except that when the nominal maximum-size coarse aggregate is 3/4 inch, it shall be between 4-1/2 and 7-1/2 percent.

2.2.4 Slump

The slump shall be determined in accordance with ASTM C 143 and shall be within the range of 1 to 4 inches. Where placement by pump is approved, the slump shall not exceed 6 inches and shall remain within a 3-inch band.

2.2.5 Pozzolan Content

If pozzolan is used, it shall range between 15 and 35 percent by weight of the total cementitious materials.

2.2.6 GGBF Slag Content

If GGBF slag is used, it shall be limited to a maximum of 15 percent by weight of the total cementitious material.

2.2.7 Determining Standard Deviation

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214. Test records from which a standard deviation is calculated shall:

- (1) represent materials, quality control procedures, and conditions similar to those expected at the proposed work;
- (2) not be from a project where the allowable changes in materials and/or proportions were more restricted than for the proposed work;
- (3) represent concrete produced to meet a specified strength or strengths, f'_c , within 1000 psi of that specified for the proposed work;
- (4) be from consecutive tests;
- (5) be from different batches;
- (6) be the average of strengths from two cylinders made from the same sample of concrete and tested at the age indicated in above paragraph 1.7.2 and;
- (7) be from concrete that was produced within one year of the time when concrete placement is expected to begin for the proposed work.

2.2.7.1 For 30 or more Test Records

Use an unmodified standard deviation and calculate f_{cr} as specified in paragraph 2.2.8.1.

2.2.7.2 For 15 to 29 Test Records

Where a concrete production facility does not have 30 test records, but does have a record based on 15 to 29 consecutive tests, a modified standard deviation may be established as the product of the standard deviation based on 15 to 29 tests and modification factor from the following table. Calculate f_{cr} as specified in paragraph 2.2.8.1.

<u>Number of Records *</u>	<u>Modification Factor for Standard Deviation</u>
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15	1.16
20	1.08
25	1.03
30 or more	1.00

*Interpolate for intermediate numbers of records.

2.2.7.3 For Less Than 15 Test Records

No standard deviation is needed. Calculation of f_{cr} shall be as specified in paragraph 2.2.8.2.

2.2.8 Required Average Compressive Strength, f_{cr}

In meeting the strength requirements specified in paragraph 1.7.2, the selected mixture shall have proportions so as to produce an f_{cr} exceeding f'_c as indicated in paragraph 2.2.8.1 or 2.2.8.2.

2.2.8.1 For 15 or more Records

If a standard deviation is calculated as specified in paragraph 2.2.7, f_{cr} shall be determined based on the value of f'_c and the standard deviation, S , as follows:

<u>Standard Deviation, S</u>	<u>Required Average Compressive Strength, f_{cr} (psi)</u>
Less than or equal to 505	$f'_c + 1.34 S$
Greater than 505	$f'_c + 2.33 S - 500$

2.2.8.2 For less than 15 Records

When a concrete production facility does not have field strength test records for calculation of standard deviation, f_{cr} , shall be determined based on the value of f'_c as follows:

<u>Specified Compressive Strength, f'_c (psi)</u>	<u>Required Average Compressive Strength, f_{cr} (psi)</u>
Less than 3000	$f'_c + 1000$
3000-5000	$f'_c + 1200$
Greater than 5000	$f'_c + 1400$

2.2.9 Documenting Average Strength

Documentation that proposed concrete proportions produce the required average strength, f_{cr} , determined in paragraph 2.2.8 shall be based on previous field

experience (paragraph 2.2.9.1) or laboratory trial batches (paragraph 2.2.9.2). Test reports shall be from tests performed on concrete produced using the submitted mixture proportions.

2.2.9.1 Field Experience

Required average strength can be documented by field experience if compressive strength test records consisting of not less than 10 consecutive tests and encompassing a period of not less than 60 days are used. Test records shall represent similar materials to those proposed and similar conditions to those expected. Changes in materials, conditions, and proportions within the test record shall not have been more closely restricted than those for the proposed work. Concrete mixtures shall have a slump and air content within $\pm \frac{3}{4}$ inch and ± 0.5 percent, respectively, of the maximum permitted.

2.2.9.2 Laboratory Trial Batches

The laboratory used to develop information required by this section shall comply with ASTM C 1077.

2.2.9.2.1 Delivery of Samples

Representative samples for all concrete materials proposed for this project and a copy of this section of the contract specifications entitled "CAST-IN-PLACE STRUCTURAL CONCRETE" shall be delivered to the laboratory that performs the concrete proportioning at least 60 days (120 when pozzolan or slag is used) before concrete placement is expected to begin. Samples of aggregates will be obtained at the point of batching in accordance with the requirements of ASTM D 75. Samples of materials other than aggregate shall be representative of those proposed for the project and shall be accompanied by manufacturer's test reports indicating compliance with applicable specification requirements. When all of these materials have been delivered, the name, address, and phone number of this laboratory and a list of the sources and types of all concrete materials shall be submitted to the Contracting Officer.

2.2.9.2.2 Trial Mixtures

Trial mixtures having proportions, consistencies, maximum slump and maximum air content suitable for the work shall be made based on ACI 211.1, using at least three different water- cementitious materials ratios which will produce a range of strengths encompassing those required for the work. The trial mixtures shall have a slump and air content within $\pm \frac{3}{4}$ inch and ± 0.5 percent, respectively, of the maximum permitted. The target water- cementitious materials ratios required in paragraph 1.7.3 include the total weight of cement plus pozzolan and slag, converted from absolute volume as described in ACI 211.1. Trial mixtures shall be designed in accordance

with the procedure in ACI 211.1, Chapter 6, using the absolute volume basis for determining the required amount of fine aggregate. The dry rodded weight per cubic foot of the coarse aggregate determined according to ASTM C 29; the fineness modulus of the fine aggregate determined according to CRD-C 104; and the yield, slump and air content shall be reported. For each water-cementitious materials ratio at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested in accordance with ASTM C 39 at 7 and 28 days (also 90 if pozzolan or slag is used). From these test results a curve shall be plotted and submitted showing the relationship between water-cementitious materials ratio and strength at design age.

PART 3 EXECUTION

3.1 EQUIPMENT

3.1.1 Capacity

The batching, mixing, conveying, and placing equipment shall have a capacity of at least 30 cubic yards per hour.

3.1.2 Batch Plant

Batch plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

3.1.2.1 Batching Equipment

The batching controls shall be semiautomatic or automatic. The semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with an accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. Separate bins or compartments shall be provided for cement, pozzolan, GGBF slag, and each size group of aggregate. Aggregates shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cement, pozzolan, or GGBF slag. If both cement and pozzolan or GGBF slag are used, they may be weighed cumulatively provided that the portland cement is weighed first. If measured by mass, the mass of the water shall not be weighed cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each admixture shall be provided. Each dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and discharged automatically in a manner to obtain uniform distribution throughout the batch in the specified mixing period. Admixtures shall not be combined prior to introduction in water. The plant shall be arranged so as to

facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment. All filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.1.2.2 Scales

The equipment for batching by mass shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. Tests shall be made at the frequency required in paragraph 3.7, and in the presence of a government inspector.

3.1.2.3 Batching Tolerances

a. Weighing Tolerances

MATERIAL	PERCENT OF REQUIRED MASS
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

b. Volumetric Tolerances - For volumetric batching equipment, the following tolerances shall apply to the required volume of material being batched:

Water: Plus or minus 1 percent.
Chemical admixtures: Zero to plus 6 percent.

3.1.2.4 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the masses of the materials being batched. An electric moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measuring moisture in the fine aggregate. The sensing element shall be arranged so that the measurement is made near the batcher charging gate of the sand bin or in the sand batcher.

3.1.3 Concrete Mixers

The concrete mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory

operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.1.3.1 Stationary Mixers

Concrete plant mixers shall be tilting, nontilting, horizontal-shaft, vertical-shaft, or pugmill and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

3.1.3.2 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

3.1.4 Conveying Equipment

The conveying equipment shall have a capacity of at least 30 cubic yards per hour. The conveying equipment shall conform to the following requirements.

3.1.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least five times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each discharge position.

3.1.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

3.1.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment may be used for transporting plant-mixed concrete over a smooth road when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.1.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete except when specifically approved.

3.1.4.5 Belt Conveyors

Belt conveyors may be used when approved. Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant trunk that is long enough to extend through the reinforcing bars.

3.1.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least three times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.1.5 Vibrators

Vibrators of the proper size, frequency, and amplitude shall be used for the type of work being performed in conformance with the following requirements:

Application	Head Diameter	Frequency	Amplitude
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	Inches	VPM	Inches
Thin walls, beams, etc.	1-1/4 to 2-1/2	9,000 to 13,500	0.02 to 0.04
General construction	2 to 3-1/2	8,000 to 12,000	0.025 to 0.05

The frequency and amplitude shall be within the range indicated in the table above as determined in accordance with paragraph 3.7.2.9

3.2 PREPARATION FOR PLACING

3.2.1 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Embedded items shall be free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding, including tack welding, will not be permitted on embedded metals within 2 feet of the surface of the concrete.

3.2.2 Concrete on Earth Foundations

Earth surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the earth foundation shall have been satisfactorily compacted in accordance with the provisions of Section 02320.

3.2.3 Reserved

3.2.4 Construction Joint Treatment

Construction joint treatment shall conform to the following requirements.

3.2.4.1 Joint Preparation

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next lift or adjacent concrete by cleaning with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean, well bonded coarse aggregate is exposed uniformly throughout the lift surface. The edges of the coarse aggregate shall not be undercut. Where preparation of the joint occurs more than 2 days prior to placing the next lift, where work in the area subsequent to the joint preparation causes dirt or debris to be deposited on the surface or where the Contracting Officer deems it necessary, the

surface shall be cleaned so that the clean, well bonded coarse aggregate is again exposed uniformly throughout the lift surface. Cleaning by high-pressure water jet or sandblasting will be required if necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material. The surfaces of construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing concrete. The surface should be washed prior to placement of the next lift.

3.2.4.2 Air-Water Cutting

Air-water cutting will not be permitted on formed surfaces or surfaces congested with reinforcing steel. Air-water cutting of a construction joint shall be performed at the proper time and only on horizontal construction joints. The surface shall be cut to remove all laitance and to expose clean, sound, mortar and coarse aggregate, but not so as to undercut the edges of the larger particles of aggregate. The air pressure used in the jet shall be 100 pounds per square inch plus or minus 10 pounds per square inch, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a retarder complying with the requirements of CRD-C 94 may be applied to the surface of the lift to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish samples of the retarder material to be used and shall demonstrate the method to be used in applications. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water.

3.2.4.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi may be used for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin of mortar is removed and there is no undercutting of coarse-aggregate particles. If the water jet is incapable of a satisfactory preparing the surface for placement of additional concrete, the surface shall be prepared by sandblasting.

3.2.4.4 Sandblasting

This method of preparing the joint surface may be used when the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. The operation shall be continued until all accumulated laitance, coatings, stains, debris, and other foreign materials are removed.

3.2.4.5 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

3.2.4.6 Surface Condition.

The surface of the lift shall be damp at the time of placement of the next lift and shall be free of standing water.

3.3 PLACING

3.3.1 Placing Procedures

The surfaces of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing concrete. Surfaces may be dampened immediately before placement if necessary. Surfaces shall be dampened immediately before placement if necessary. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement or consolidation. Depositing of the concrete shall be so regulated that it may be effectively consolidated in horizontal layers 2-feet or less in thickness with a minimum of lateral movement. The amount deposited in each location shall be that which can be readily and thoroughly consolidated. Sufficient placing capacity shall be provided so that concrete placement can be kept plastic and free of cold joints while concrete is being placed. Concrete shall be placed by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper that is conical in shape. The concrete shall not be dropped vertically more than 5 feet, except where a properly designed and sized elephant trunk with rigid drop chute bottom section is provided to prevent segregation and where specifically authorized. In no case will concrete be discharged to free-fall through reinforcing bars.

3.3.2 Conveying

Concrete shall be conveyed from mixer to forms as rapidly as practicable and within the time interval in paragraph 3.3.4 by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper that is conical in shape and shall not be dropped vertically more than 8 feet, except where suitable equipment is provided to prevent segregation and where specifically authorized. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant trunk that is long enough to extend through the reinforcing bars.

3.3.3 Placement by Pump

When concrete is to be placed by pump, the nominal maximum-size coarse aggregate shall not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the concrete pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination

of concrete in place. After each operation, equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms. Grout used to lubricate the pumping equipment at the beginning of the placement will not be incorporated into the placement.

3.3.4 Time Interval Between Mixing and Placing

Concrete shall be placed within 30 minutes after discharge into nonagitating equipment. When concrete is truck-mixed or when a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete shall be delivered to the site of the work, and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. When the length of haul makes it impossible to deliver truck-mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site.

3.3.5 Cold-Weather Placing

When cold-weather placing of concrete is likely to be subjected to freezing temperatures before the expiration of the curing period, it shall be placed in accordance with procedures previously submitted in accordance with paragraph 1.5.9. The ambient temperature of the space adjacent to the concrete placement and surfaces to receive concrete shall be above 32 degrees F. The placing temperature of the concrete having a minimum dimension less than 12 inches shall be between 55 and 75 degrees F when measured in accordance with ASTM C 1064. The placing temperature of the concrete having a minimum dimension greater than 12 inches shall be between 50 and 70 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete-placing temperatures. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals, or other materials shall not be mixed with the concrete to prevent freezing.

3.3.6 Hot-Weather Placing

Concrete shall be properly placed and finished with procedures previously submitted in accordance with paragraph 1.5 .10. The concrete-placing temperature shall not exceed 90 degrees F when measured in accordance with ASTM C 1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. An approved retarder meeting the requirements of paragraph 2.1.3.3 shall be used to facilitate placing and finishing when concrete temperatures exceed 85 degrees F. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

3.3.7 Consolidation

Immediately after placement, each layer of concrete, including flowing concrete, shall be consolidated by internal vibrating equipment. Vibrating equipment shall at all times be adequate in number of units and power to properly consolidate the concrete. The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators in working order and with competent operators are available. A spare vibrator shall be kept on the job site during all concrete placing operations. Placing shall not be continued if any pile of concrete is inadequately consolidated. Vibrators shall not be used to transport concrete within the forms. Hand spading may be required, if necessary, with internal vibrating along formed surfaces permanently exposed to view. Form or surface vibrators shall not be used unless specifically approved. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding unhardened layer if such exists. It shall be held stationary until there is a general cessation in escape of large bubbles of entrapped air at the surface of the concrete (generally 5 to 15 seconds) then withdrawn slowly at about 3 inches per second.

3.4 FINISHING

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 50 degrees F. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour, provisions for windbreaks, shading, fog spraying, or wet covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow. All unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, unless a trowel finish is specified, and shall be true to the elevation shown in the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings and left true and regular. Exterior surfaces shall be sloped for drainage unless otherwise shown in the drawing or as directed. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or jitterbugs shall not be used.

3.4.1 Unformed Surfaces

3.4.1.1 Float Finish

Surfaces shall be screeded and darried or bullfloated to bring the surface to the required finish level with no coarse aggregate visible. No water, cement, or mortar shall be added to the surface during the finishing operation. The concrete, while still green but sufficiently hardened to bear a man's weight without more than about a 1/4 inch indentation, shall be floated to a true and even plane. Floating may be performed by use of suitable hand floats or power-driven equipment. Hand floats shall be made of magnesium or aluminum. Tolerance for a floated finish shall be true

plane within 5/16 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.

3.4.1.2 Trowel Finish

A trowel finish shall be applied to the following surfaces: top surfaces of all walls and column. Concrete surfaces shall be finished with a float finish, and after surface moisture has disappeared, the surface shall be troweled to a smooth, even, dense finish free from blemishes including trowel marks. Tolerance shall be true planes within 5/16 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.

3.4.2 Formed Surfaces

Unless another finish is specified, surfaces shall be left with the texture imparted by the forms except that all tie rod holes and defective concrete surfaces shall be repaired as described in paragraph 3.4.3. Other finishes shall be applied to the following structures or portions of structures:

DRAINAGE STRUCTURES:

TYPE OF FINISH	STRUCTURE OR PORTION OF STRUCTURE
Class A	All exposed faces and surfaces, including interior of drainage structures.
Class D	Unexposed slabs, floors and walls, top of slabs and approach slabs

INVERTED T-WALLS:

TYPE OF FINISH	STRUCTURE OR PORTION OF STRUCTURE
Class A	The top and all sides of the T-wall and Wingwall stems and top of slabs. Slab sides to a limit 12 inches below the top of slab elevation.

Uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that is exposed to view or on which a special finish is required. The form panels used to produce the finish shall be orderly in arrangement, with joints between panels planned in approved relation to openings, corners, and other architectural features. Forms shall not be reused if there is any evidence of surface wear or defects that would impair the quality of the surface.

3.4.3 Formed Surface Repair

Within 24 hours after form removal, all ridges, lips, loose materials and bulges on surfaces permanently exposed to view shall be removed. All tie rod holes and defective concrete surfaces shall be repaired. All repairs shall be completed within 48 hours after form removal. All voids and honeycombs exceeding 2-inch in diameter permanently exposed to view and all tie-rod holes, permanently exposed or not, shall be reamed or chipped and filled with dry-pack mortar. Defective areas larger than 36 square inches in any surface, permanently exposed or not, shall be delineated in a rectangular shape by a saw cut a minimum depth of 1 inch. All defective concrete in the delineated area shall be removed and replaced with carefully placed and compacted concrete. The prepared area shall be dampened, brush-coated with a neat cement grout or with an approved latex bonding agent, and filled with mortar or concrete. The mortar shall consist of 1 part cement to 2-1/2 parts fine aggregate. The fine aggregate shall be that used for production of project concrete. The quantity of mixing water for both the mortar and concrete shall be the minimum necessary to obtain a uniform mixture and to permit placing. The mortar shall be remixed over a period of at least 30 minutes without addition of water until it obtains the stiffest consistency that will permit placing. Trial batches shall be used to determine the proportions required to match colors. Mortar shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc. and struck off to match adjacent concrete. The cement used in the dry-packed mortar or replacement concrete shall be a blend of the cement used for the production of project concrete and white portland cement properly proportioned so that the final color when cured shall match the color of the adjacent concrete. Replacement concrete and mortar shall be produced using project materials and shall be proportioned by the Contracting Officer. Replacement concrete shall be drier than the usual mixture, thoroughly compacted into the prepared void by internal vibration, tamping, rodding, ramming, etc. and shall be struck off and finished to match adjacent concrete. Forms shall be used if required. Temperature of the concrete, ambient air, replacement concrete, or mortar during placement, finishing, and curing shall be above 40 degrees F. Metal tools shall not be used to finish permanently exposed surfaces. The patched areas shall be cured and protected for 7 days. Other methods and materials for repair may be used only when approved in writing by the Contracting Officer. Repairs of the so called "plaster-type" will not be permitted.

3.5 CURING AND PROTECTION

3.5.1 Duration

The length of the curing period shall be determined by the type of cementitious material, as specified below. Concrete shall be cured by an approved method.

Type III portland cement _____ 3 days

Type I portland
cement _____ 7 days

Type IP
cement _____ 7 days

Type II portland
cement _____ 14 days

Portland cement blended
with 25 percent or less
pozzolan or GGBF slag _____ 14 days

Portland cement blended
with more than 25 percent
pozzolan or GGBF slag _____ 21 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperature, rapid temperature change, and mechanical injury/damage. All materials and equipment needed for adequate curing and protection shall be available, in working order and at the placement site prior to the start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours and from flowing water for 14 days (7 days with Type III cement). No fire or excessive heat including welding shall be permitted near or in direct contact with concrete or concrete embedments at any time.

3.5.2 Moist Curing

Moist-cured concrete shall be maintained continuously, not periodically, wet for the entire curing period. Vertical surfaces shall be cured using soaker hoses, fog sprayers or sprinklers. Burlap may be used to assist moist curing provided that the wall and burlap are kept continuously saturated, including nights and weekends, and the burlap is kept in contact with the concrete being cured. If water or curing materials stain or discolor concrete surfaces that are to be permanently exposed, they shall be cleaned as required in paragraph 1.8.3. Where wooden form sheathing is left in place during curing, the sheathing shall be kept wet at all times. Where steel forms are left in place during curing, the forms shall be carefully broken loose from the hardened concrete and curing water continuously applied into the void so as to continuously

saturate the entire concrete surface. Horizontal surfaces may be moist cured by ponding, by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated nonstaining burlap or cotton mats. Horizontal construction joints may be allowed to dry for 12 hours immediately prior to the placing of the following lift.

3.5.3 Membrane-Forming Curing Compound

3.5.3.1 General

Concrete may be cured with an approved membrane-forming curing compound in lieu of moist curing except that membrane curing will not be permitted on any surface containing protruding steel reinforcement, or that are to receive any subsequent treatment depending on adhesion or bonding to the concrete (i.e. sack rubbed, etc). Curing compounds shall not be used on concrete surfaces that are maintained at curing temperature by use of free steam. A pigmented-type curing compound shall not be used on surfaces that will be exposed to view when the project is complete. Concrete cured with a nonpigmented curing compound must be shaded from the sun for the first 3 days when the ambient temperature is 90 degrees F or higher.

3.5.3.2 Application

The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water, and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared and bleeding has stopped. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces that have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause that will disrupt the continuity of the curing membrane.

3.5.4 Impervious Sheet Curing

The following concrete surfaces may be cured using impervious sheets: horizontal surfaces only. Sheet curing shall not be used on vertical or near-vertical surfaces. All surfaces shall be thoroughly wetted and be completely covered with waterproof paper or polyethylene-coated burlap having the burlap thoroughly water-saturated before placing. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than

4 inches and taped to form a continuous cover with completely closed joints. The sheets shall be weighted to prevent displacement so that they remain in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.5.5 Cold-Weather Curing and Protection

When the daily outdoor low temperature is less than 32 degrees F, the temperature of the concrete shall be maintained above 40 degrees F for the first 7 days after placing. In addition, during the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by observation of ambient and concrete temperatures indicated by suitable temperature measuring devices furnished by the Contractor as required and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor at such locations as may be directed.

3.6 SETTING OF BASE PLATES AND BEARING PLATES

3.6.1 Setting of Plates

After being plumbed and properly positioned, bearing plates for beams and similar structural members shall be provided with full bearing with nonshrink grout. The space between the top of concrete or masonry-bearing surface and the bottom of the plate shall be approximately 1/24 of the width of the plate, but not less than 1/2 inch for plates less than 12 inches wide. Concrete surfaces shall be rough, clean, and free of oil, grease, and laitance, and they shall be damp. Metal surfaces shall be clean and free of oil, grease, and rust.

3.6.2 Nonshrink Grout Application

Nonshrink grout shall conform to the requirements of paragraph 2.1.6. Water content shall be the minimum that will provide a flowable mixture and fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.6.2.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or masonry-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for retaining the

grout and shall be removed after the grout has set. If grade "A" grout as specified in ASTM C 1107 is used, all surfaces shall be formed to provide restraint. The placed grout shall be worked to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.6.2.2 Treatment of Exposed Surfaces

After the grout has set, those types containing metallic aggregate shall have the exposed surfaces cut back 1 inch and immediately covered with a parge coat of mortar proportioned by mass of one part portland cement, two parts sand, and sufficient water to make the mixture placeable. The parge coat shall have a smooth, dense finish. The exposed surface of other types of nonshrink grout shall have a smooth, dense finish.

3.6.2.3 Curing

Grout and parge coats shall be cured in conformance with paragraph 3.5.

3.7 TESTS AND INSPECTIONS

Tests and inspections shall conform to the following requirements.

3.7.1 General

The Contractor shall perform the inspections and tests described below, and, based upon the results of these inspections and tests, he shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease. The laboratory performing the tests shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technician, Grade I. The individuals who perform the inspection of concrete construction shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077.

3.7.2 Testing and Inspection Requirements

3.7.2.1 Fine Aggregate

a. Grading - At least once during each shift in which concrete is being delivered, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and CRD-C 104, respectively, for the fine aggregate or for each fine aggregate, if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. Results of tests shall be reported in writing.

b. Corrective Action for Fine Aggregate Grading - When the amount passing any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer, and immediate steps shall be taken to rectify the situation.

c. Moisture Content Testing - When in the opinion of the Contracting Officer the electric moisture meter is not operating satisfactorily, at least four tests for moisture content shall be conducted in accordance with either ASTM C 70, C 566, or CRD-C 112 during each 8-hour period of mixing plant operation. The times for the tests shall be selected randomly within the 8-hour period. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman. When the electric moisture meter is operating satisfactorily, at least two direct measurements of moisture content shall be made per week to check the calibration of the meter. The results of tests for moisture content shall be used to adjust the added water in the control of the batch plant.

d. Moisture Content Corrective Action - Whenever the moisture content of the fine aggregate changes by 0.5 percent or more, the scale settings for the fine-aggregate batcher and water batcher shall be adjusted (directly or by means of a moisture compensation device) if necessary to maintain the specified slump.

3.7.2.2 Coarse Aggregate

a. Grading - At least once during each shift in which concrete is being delivered, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. A test record of samples of aggregate taken shall show the results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the

specification limits for samples taken other than at the batch plant bins to allow for degradation during handling. Results of tests shall be reported in writing.

b. Corrective Action for Grading - When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of five tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

c. Coarse Aggregate Moisture Content - A test for moisture content of each size of coarse aggregate in accordance with ASTM C 566 or CRD-C 112 shall be made at least once a shift. When two consecutive readings for smallest size coarse aggregate differ by more than 1.0 percent, frequency of testing shall be increased to that specified for fine aggregate in above paragraph 3.7.2.1c. These results shall be used to adjust the added water in the control of the batch plant.

d. Coarse Aggregate Moisture Corrective Action - Whenever the moisture content of any size of coarse aggregate changes by 0.5 percent or more, the scale setting for the coarse aggregate batcher and the water batcher shall be adjusted if necessary to maintain the specified slump.

3.7.2.3 Deleterious Substances

a. When in the opinion of the Contracting Officer a problem exists in connection with deleterious substances in fine or coarse aggregates, tests shall be made in accordance with ASTM C 33 at a frequency not less than one per week. Results of tests shall be reported in writing.

b. When the results for a deleterious substance are outside the specification limit, the aggregate shall be resampled and retested for the deleterious substance that failed. If the second sample fails, that fact shall be reported to the Contracting Officer. When material finer than No. 200 sieve for coarse aggregate exceeds the specification limit, immediate steps, such as washing or other corrective actions, shall be initiated.

3.7.2.4 Scales

a. Weighing Accuracy - The accuracy of the scales shall be checked by test weights at least once a month for conformance with the applicable requirement of above paragraph 3.1.2.2. Such tests shall also be made whenever there are variations in properties of the fresh concrete that could result from batching errors. Results of tests shall be reported in writing.

b. Batching and Recording Accuracy - Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. The Contractor shall confirm that the calibration devices described in paragraph 3.1.2 for checking the accuracy of dispensed admixtures are operating properly. Results of tests shall be reported in writing.

c. Scales Corrective Action - When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.7.2.5 Batch-Plant Control

The measurement of all constituent materials including cement, pozzolan, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining admixture shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during plant operation. In addition, batch reports shall contain all information needed to calculate the total mixing water by the producer, including the amount of water as free moisture on each size of aggregate, water and ice weights per cubic yard and water added in the field for each class of concrete batched as required in paragraph 16.2.4 of ASTM C 94. The batch report shall be furnished to the Contracting Officer upon delivery of each batch of concrete.

3.7.2.6 Concrete Mixture

a. Test Cylinders. Concrete will be sampled in accordance with ASTM C 172. Test samples for each class of concrete will be taken at least once every 8-hour shift or for every 150 cubic yards placed, whichever requires more samples. Companion sets, each consisting of three concrete cylinders, shall be prepared by the Contractor in accordance with ASTM C 31 in the presence of the Contracting Officer. Before cylinders are molded, slump and air content must be deemed acceptable as determined in accordance with ASTM C 143 and ASTM C 231, respectively. The cylinders shall be clearly labeled on the sides of the cylinder molds, initially cured according to ASTM C 31 paragraphs 9.1 and 9.2, and protected and transported by the Contractor to the Government testing laboratory according to ASTM C 31. If the Contractor does not deliver the cylinders to the testing laboratory within 24 to 48 hours after molding, they will be submerged in a water tank provided by the Contractor, where the surrounding water temperature is maintained by the Contractor at 73.4 ± 3 degrees F.

Cylinders shall be delivered to the New Orleans District Soils and Materials Processing Unit, located in New Orleans, LA. at the Foot of Prytania Street, between the hours of 8:00 AM and 3:00 PM on federal workdays. The cylinders will be tested by the Government at the Government's expense. One cylinder will be tested at 7 days for information. The other two companion cylinders will be tested at the age of 28 days (90 days if pozzolan is used) for acceptance."

b. Air Content Testing - Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government quality assurance representative. Tests shall be made in accordance with ASTM C 231. Test results shall be plotted on control charts, which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single test result reaches either the upper or lower action limit a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the control chart for air content and the control chart for range, and for determining the need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph 2.2.3. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the air content at the mixer controlled as directed.

c. Air Content Corrective Action - Whenever points on the control chart approach the upper or lower control limits, an adjustment should be made in the amount of air-entraining admixture batched. If a single test result is outside the specification limit, such adjustment is mandatory. As soon as practical after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever a point falls above the upper control limit for range, the dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility. Whenever two consecutive points for either average or range are outside the control limits, the Contracting Officer shall be notified. Whenever the

air content departs from the specified range, the concrete shall not be delivered to the forms.

d. Slump Testing - In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government's quality assurance representative. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made on the same batch of concrete. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control chart for percent air and the chart for range, and for determining the need for any remedial action. An upper warning limit shall be set at 1/2 inch below the maximum allowable slump on separate control charts for percent air used for each type of mixture as specified in paragraph 2.2.4, and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the slump at the mixer controlled as directed.

e. Slump Corrective Action - Whenever points on the control chart approach the upper or lower control limits, an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum W/CM specified, based upon aggregates which are in a saturated surface-dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted and the Contractor shall take appropriate steps to bring the slump under control. Also, additional slump tests shall be made as directed. All this shall be at no additional cost to the Government.

If the adjustments to the batch weights of water and fine aggregate do not satisfactorily produce the required slump, the mixture shall be reportioned to meet the specified criteria and resubmitted to the Contracting Officer for approval.

f. Temperature - The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.

g. Compressive-Strength Specimens - At least one set of test specimens shall be made each day on each different concrete mixture placed during the day. Additional sets of test cylinders shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A random sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph 1.7 shall consist of four cylinders, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per specified paragraph 1.7 shall consist of six cylinders, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. All compressive-strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength tests, moving average for strength, and moving average for range for each mixture. The charts shall be similar to those found in ACI 214.

3.7.2.7 Inspection Before Placing

Foundation or construction joints, forms, and embedded items shall be inspected for quality by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.7.2.8 Placing

a. Placing Inspection - The placing foreman shall supervise all placing operations, shall determine that the correct quality of concrete or grout is placed in each location as directed and shall be responsible for measuring and recording concrete and ambient temperatures hourly during placing operations, weather conditions, time of placement, placement duration, yardage placed, and method of placement. Concrete temperatures shall be determined in accordance with ASTM C 1064. A report shall be furnished in writing to the Contracting Officer.

b. Placing Corrective Action - If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.7.2.9 Vibrators

a. Vibrator Testing and Use - The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined at the same time the vibrator is operating in concrete with the tachometer held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.

b. Vibrator Corrective Action - Any vibrator not meeting the requirements of paragraph 3.1.5 shall be immediately removed from service and repaired or replaced.

3.7.2.10 Curing

a. Moist-Curing Inspections - At least once each shift, and once per day on nonwork days an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and reported in writing.

b. Moist-Curing Corrective Action - When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for such areas shall be extended by one (1) day.

c. Membrane-Curing Inspection - No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the quantity of compound used and the area of concrete surface covered shall be reported, and the rate of coverage in square feet per gallon shall be computed. The report shall state whether coverage is uniform.

d. Membrane-Curing Corrective Action - When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

e. Sheet-Curing Inspection - At least once each shift and once per day on nonwork days, an inspection shall be made of all areas being cured using

impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.

f. Sheet-Curing Corrective Action - When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by one (1) day.

3.7.2.11 Cold-Weather Protection and Sealed Insulation Curing

At least once each shift and once per day on nonwork days, an inspection shall be made of all areas subject to cold-weather protection. The protection system shall be inspected for holes, tears, unsealed joints, or other deficiencies that could result in damage to the concrete. Special attention shall be taken at edges, corners, and thin sections. Any deficiencies shall be noted, corrected, and reported. During removal of protection, measurement of concrete and ambient temperatures shall be recorded at least hourly. A report shall be furnished in writing to the Contracting Officer.

3.7.2.12 Cold-Weather Protection Corrective Action

a. When a daily inspection report lists any holes, tears, unsealed joints, or other deficiencies, the deficiency shall be corrected immediately and the period of protection extended 1 day.

b. When any concrete temperature during the period of protection or protection removal fails to comply with the specifications, that fact shall be reported to the Contracting Officer, and immediate steps shall be taken to correct the situation.

3.7.2.13 Mixer Uniformity

a. Stationary Mixers - Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, if less than 6 months in duration, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. Whenever adjustments in mixer or increased mixing times are necessary because of failure of any mixer to comply, the mixer shall be retested after adjustment. Results of tests shall be reported in writing.

b. Truck Mixers - Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory. Results of tests shall be reported in writing.

3.7.2.14 Mixer Uniformity Corrective Action

When a mixer fails to meet mixer uniformity requirements, either the mixer shall be removed from service on the work, the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.7.3 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. Each report shall include the updating of control charts covering the entire period from the start of construction through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports and Contractor's daily log of construction. The Contracting Officer has the right to examine all Contractor quality control records.

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SECTION 09940 - PAINTING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances, and materials and performing all operations in connection with preparation of surfaces and application of paint and other specified materials. This work shall be accomplished in complete and strict accordance with the specifications and the applicable drawings and shall be subject to the terms and conditions of the contract.

1.1.1 Work Performance

Work shall be performed in accordance with the requirements of 29 CFR 1910, 29 CFR 1926, EM 385-1-1, and other references as listed herein. Matters of interpretation of the standards shall be submitted to the Contracting Officer for resolution before starting work. Where the regulations conflict, the most stringent requirements shall apply.

1.2 MEASUREMENT AND PAYMENT

1.2.1 Gates and Bulkheads

No separate measurement or payment will be made for painting gates, bulkheads, corner protection angles, hinges, miscellaneous metals, and ferrous materials. Payment for painting these items shall be included in the contract price for the items to which the work pertains.

1.2.2 Sheet Piling

No measurement will be made for painting sheet piling. Payment for all painting work performed and for all materials furnished under the section of the specifications for painting sheet piling will be included in the contract lump sum price for "Painting". Price and payment shall constitute full compensation for furnishing all plant, labor, materials and equipment, including compliance with the safety and health provisions, all as specified herein.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z87.1a	(1997) Occupational and Educational Eye and Face Protection
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 561	(1982) Carbon Black Pigment for Paint
ASTM D 740	(1994) Methyl Ethyl Ketone
ASTM D 841	(2002) Nitration Grade Toluene
ASTM D 843	(2002) Nitration Grade Xylene
ASTM D 1045	(1995) Sampling and Testing Plasticizers Used in Plastics
ASTM D 1153	(1994) Methyl Isobutyl Ketone
ASTM D 1186	(2001) Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
ASTM D 1200	(1994) Viscosity by Ford Viscosity Cup
ASTM D 1210	(1996) Fineness of Dispersion of Pigment-Vehicle Systems
ASTM D 2917	(2002) Methyl Isoamyl Ketone
ASTM D 4417	(1993) Measurement of Surface Profile of Blast Cleaned Steel
ASTM E 1347	(1997) Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.20	Access to Employee Exposure and Medical Records
29 CFR 1910.94	Ventilation

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910, Subpart I	Personal Protective Equipment
29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 50.6	National Primary and Secondary Ambient Air Quality Standards for Particulate Matter
40 CFR 58, App E	Probe Siting Criteria for Ambient Air Quality Monitoring
40 CFR 60, App A, Mtd 22	Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.22	Number of Copies
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
49 CFR 171, Subchapter C	Hazardous Materials Regulations

ENGINEERING MANUAL (EM)

EM 385-1-1	U.S. Army Corps of Engineers Safety and Health Requirements Manual (3 Sep 96 Edition)
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LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Louisiana Administrative Code (LAC), Title 33, Environmental Quality, Part V, Hazardous Waste and Hazardous Materials.

Louisiana Administrative Code (LAC), Title 33, Environmental Quality, Part VII, Solid Waste Regulations.

MACBETH DIVISION (MD)

40219 (Matte Edition) Munsell Book of Color: Matte Finish Collection

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 National Electrical Code

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100 (1984; Supple 1985, 1987, 1988, & 1990)NIOSH Manual of Analytical Methods

THE SOCIETY FOR PROTECTIVE COATINGS

Paint 16 (1991) Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint

SP 1 (1982) Solvent Cleaning

SP 5 (2000) White Metal Blast Cleaning

SP 7 (2000) Brush-Off Blast Cleaning

Guide 6 (CON) (1994) Containing Debris Generated During Paint Removal Operations

Guide 6I (CON) (1992) Containing Debris Generated During Paint Removal Operations

1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330, "SUBMITTAL PROCEDURES":

1.4.1 Statements

1.4.1.1 Qualifications and Experience; GA

The Contractor shall provide certification pursuant to paragraph 1.5 for all job sites. Submittal of the qualifications and experience of any additional qualified and competent persons the CIH, IH, CSP employs to provide on-site safety and health will also be provided. Acceptance of this submission must be obtained prior to the submission of other required safety and health submittal items.

1.4.1.2 Accident Prevention Plan; GA

The requirements included in Section 01 of EM 385-1-1 shall be followed by the Contractor when preparing the Accident Prevention Plan. The plan shall be prepared for all sites and shall include, but is not limited to, each of the topic areas listed in Appendix A therein and the requirements of paragraph 1.7; each topic shall be developed in a concise manner to include management and operational aspects.

1.4.1.3 Confined Space Procedures; GA

The Contractor shall develop detailed written standard operating procedures for confined spaces for all job sites in accordance with 29 CFR 1910.146, EM 385-1-1, and as further described in this paragraph.

1.4.1.3.1 Certificates of Calibration

The Contractor shall supply certificates of calibration for all testing and monitoring equipment. The certificates of calibration shall include: type of equipment, model number, date of calibration, firm conducting calibration, and signature of individual certifying calibration.

1.4.1.3.2 Methods of Inspection

The procedures shall include methods of inspection of personal protective equipment prior to use.

1.4.1.3.3 Work Practices

The procedures shall include work practices and other engineering controls designed to reduce airborne hazardous chemical exposures to a minimum.

1.4.1.3.4 Specification of the Design

The procedures shall include specification of the design and installation of ventilation systems which shall provide adequate oxygen content and provide for the dilution of paint solvent vapor, lead, and other toxic particulates within the confined space. In addition, the contractor shall include plans to evaluate the adequacy of air flow patterns.

1.4.1.4 Respiratory Protection Program; GA

The Contractor shall develop a comprehensive written respiratory protection program for all job sites in accordance with 29 CFR 1910.134, 29 CFR 1926.62, and Section 05.E of EM 385-1-1.

1.4.1.5 Airborne Sampling Plan; GA

The contractor shall develop an Airborne Sampling Plan for all job sites detailing the NIOSH Pub No. 98-119, Factory Mutual, or Underwriters Laboratories approved equipment, equipment calibration procedures, sampling methods, sampling to be performed, and analytical procedures to be used based on the type of work to be performed and anticipated toxic contaminants to be generated. The contractor shall include the name of the accredited laboratory, listed by the American Industrial Hygiene Association (AIHA), to be used to conduct the analysis of any collected air samples. In addition, the contractor shall provide the Contracting Officer with a copy of the test results from the laboratory within 5 working days of the sampling date and shall provide results from direct-reading instrumentation on the same day the samples are collected.

1.4.1.6 Ventilation Assessment; GA

The contractor shall develop a plan to provide ventilation assessment for all job sites as required by paragraph 1.7.4.1.

1.4.1.7 Medical Surveillance Plan; GA

The Contractor shall develop a plan to provide medical surveillance to the workforce for all job sites as required in paragraph 1.8 and provide a statement from the examining physician indicating the name of each employee evaluated and any limitations which will preclude the employee from performing the work required. The statement shall include the date of the medical evaluation, the physician's name, signature, and telephone number. Medical records shall be maintained as required by 29 CFR 1910.20.

1.4.1.8 Waste Classification, Handling, and Disposal Plan; GA

The Contractor is responsible for assuring the proper disposal of all hazardous and nonhazardous waste generated during the project. Therefore, the contractor shall develop a Waste Classification, Handling, and Disposal Plan for all job sites in accordance with the requirements of Louisiana Administrative Code (LAC), Title 33, Environmental Quality, Part V, Hazardous Waste and Hazardous Materials and Part VII, Solid Waste Regulations and subparagraph 1.12.1. In addition, the following provisions shall be included:

1.4.1.8.1 Testing Laboratory for Waste

The name and address of the laboratory which has Accreditation-Applied status with the Louisiana Department of Environmental Quality (LDEQ) laboratory certification

program and performs any or all of the laboratory testing for waste determinations shall be included in the Waste Classification, Handling, and Disposal Plan.

1.4.1.8.2 Storage of Hazardous Waste

The closed containers storing any hazardous waste shall be described and listed in the Waste Classification, Handling, and Disposal Plan. .

1.4.1.8.3 Storage of Non-Hazardous Waste

The closed containers for nonhazardous waste shall be described and listed in the Waste Classification, Handling, and Disposal Plan. .

1.4.1.8.4 Transportation of Hazardous Waste

The name of the licensed transporters and hazardous waste and hazardous materials shall be included in the Waste Classification, Handling, and Disposal Plan.

1.4.1.8.5 Transportation of Non-Hazardous Waste

A statement that the nonhazardous waste are to be transported in accordance with local regulations regarding waste transportation, including a list of the local regulations, shall be included in the Waste Classification, Handling, and Disposal Plan

1.4.1.8.6 Transportation Manifest

In addition to the number of manifest copies required by 40 CFR 262.22, one copy of each manifest will be supplied to the Contracting Officer prior to transportation.

1.4.1.9 Containment Plan; GA

For jobsites with tight controls on emissions but lead is not present, the Contractor shall develop a plan for containing all spent abrasive waste. The containment shall comply with the requirements of SSPC Guide 6 (CON). The Contractor shall also identify the type and placement of water booms, methods for anchoring the booms, and the procedures for removing debris.

1.4.1.10 Ambient Air Monitoring Plan for Particulate Emissions; GA

For all jobs requiring tight control on emissions where lead is not present, the Contractor shall develop a plan for monitoring emissions of particulate matter 10 microns or less in size (PM-10). The plan shall comply with the requirements of EPA regulation 40 CFR 50.6, subparagraph 1.12.3.1, and shall include provisions for halting work and correcting the containment in the event unacceptable emissions occur.

1.4.1.11 Visible Emissions; GA

For all jobs requiring tight control on emissions where lead is not present, the Contractor shall submit a Visible Emissions Monitoring Plan in accordance with subparagraph 1.12.2. The plan shall also include the provisions for halting work and correcting the containment in the event unacceptable emissions are observed. General statements shall not be used; specific methods, procedures, and details are required. Random emissions from the containment shall not exceed 1 percent of the work day. The Contractor shall document each time that the work is halted due to a violation of the visible emissions criteria. Documentation shall include the cause for shutdown and the corrective action taken to resolve the problem.

1.4.2 Samples

1.4.2.1 Special Paint Formulas; GA

Samples of special paint formulas, listed in paragraph 2.1 shall be submitted. For all vinyl-type paints submitted for laboratory testing, separate 1/2-pint samples of ingredient raw materials shall be furnished. The ingredient samples shall be clearly identified by commercial name, trade designation, manufacturer, batch or lot number, and such other data as may be required. For all epoxy type paints submitted for laboratory testing, a list of ingredient raw materials identifying commercial name, trade designation, manufacturer, batch or lot number, and such other data as may be required shall be furnished.

1.4.2.1.1 Proprietary paints

When the required quantity of a particular type or color of a paint is 10 gallons or less, a proprietary, name-brand, shelf item paint of the same type and with similar properties to the material specified may be proposed without sampling. Proprietary paints are any which do not follow the formulas in paragraph 2.1, or the complete specification requirements of Federal, Military, and the Society of Protective Coatings specifications. To receive consideration, a statement from the supplier that the paint is appropriate as to type, color, and gloss and is a premium grade of paint shall be furnished.

1.4.2.2 Thinners; GA

Samples shall be submitted of the thinners which are those solvents used to reduce the viscosity of the paint.

1.4.3 Records

1.4.3.1 Inspections and Operations; GA

The Contractor shall document and submit records of inspections and operations performed. Submittals shall be made on a timely basis and shall include, but are not limited to,:

- a. Inspections performed, including the area of the structure involved and the results of the inspection.
- b. Surface preparation operations performed, including the area of the structure involved, the mode of preparation, the kinds of solvent, abrasive, or power tools employed, and whether contract requirements were met.
- c. Thinning operations performed, including thinners used, batch numbers, and thinner/paint volume ratios.
- d. Application operations performed, including the area of the structure involved, mode of application employed, ambient temperature, substrate temperature, dew point, relative humidity, type of paint with batch numbers, elapsed time between surface preparation and application, elapsed time for recoat, condition of underlying coat, number of coats applied, and if specified, measured dry film thickness or spreading rate of each new coating.

1.4.3.2 PM-10 Monitoring Report

The Contractor shall submit reports of the PM-10 monitoring tests as described in subparagraph 1.12.3.1.

1.4.3.3 TSP Monitoring Report

The Contractor shall submit reports of the TSP monitoring tests as described in subparagraph 1.12.3.2.

1.4.3.4 Airborne Sampling Report

The Contractor shall submit reports of airborne sampling tests as required by subparagraph 1.7.5.1.

1.5 QUALIFICATIONS

Qualifications and experience shall comply with the following.

1.5.1 Certified Professional

The Contractor shall provide a person who is qualified and competent as defined in Section 01 of EM 385-1-1, will develop the required safety and health submittal, and will be responsible for on-site safety and health during the contract period. The

person shall be a Certified Industrial Hygienist (CIH), an Industrial Hygienist (IH), or a Certified Safety Professional (CSP) with a minimum of 3 years of demonstrated experience in similar related work. The Contractor shall certify that the Certified Industrial Hygienist (CIH) holds current and valid certification from the American Board of Industrial Hygiene (ABIH), that the IH is considered board eligible by written confirmation from the ABIH, or that the CSP holds current and valid certification from the American Board of Certified Safety Professionals. The CIH, IH, or CSP may utilize other qualified and competent persons, as defined in EM 385-1-1, to conduct on-site safety and health activities as long as these persons have a minimum of 3 years of demonstrated experience in similar related work and are under the direct supervision of the CIH, IH, or CSP.

1.5.2 Certified Laboratory

The Contractor shall provide documentation which includes the name, address, and telephone number of the laboratories to be providing services.

1.6 SAMPLING AND TESTING

The Contractor shall allow at least 30 days for sampling and testing. Sampling may be at the jobsite or source of supply. The Contractor shall notify the Contracting Officer when the paint is available for sampling. Sampling of each batch shall be witnessed by the Contracting Officer unless otherwise specified or directed. A 1-quart sample of paint and thinner shall be submitted for each batch proposed for use. The sample shall be labeled to indicate formula or specification number and nomenclature, batch number, batch quantity, color, date made, and applicable project contract number. Testing will be performed by the Government. Costs for retesting rejected material will be deducted from payments to the Contractor at the rate of \$300.00 dollars for each sample retested.

1.7 SAFETY AND HEALTH PROVISIONS

Paragraph 1.7 supplements the requirements of EM 385-1-1, paragraph (1). In any conflict between Section 01 of EM 385-1-1 and this paragraph, the provisions herein shall govern.

1.7.1 Abrasive Blasting

The Contractor shall comply with the requirements in Section 06.H of EM 385-1-1.

1.7.1.1 Hoses And Nozzles

In addition to the requirements in Section 20 of EM 385-1-1, hoses and hose connections of a type to prevent shock from static electricity shall be used. Hose lengths shall be joined together by approved couplings of a material and type

designed to prevent erosion and weakening of the couplings. The couplings and nozzle attachments shall fit on the outside of the hose and shall be designed to prevent accidental disengagement.

1.7.1.2 Workers Other Than Blasters

Workers other than blasting operators working in close proximity to abrasive blasting operations shall be protected by utilizing MSHA/NIOSH-approved half-face or full-face air purifying respirators equipped with high-efficiency particulate air (HEPA) filters, eye protection meeting or exceeding ANSI Z87.1 and hearing protectors (ear plugs and/or ear muffs) providing at least 20 dBA reduction in noise level.

1.7.2 Cleaning with Compressed Air

Cleaning with compressed air shall be in accordance with Section 20.B.5 of EM 385-1-1 and personnel shall be protected as specified in 29 CFR 1910.134.

1.7.3 Cleaning with Solvents

1.7.3.1 Ventilation

Ventilation shall be provided where required by 29 CFR 1910.146 or where the concentration of solvent vapors exceeds 10 percent of the Lower Explosive Limit (LEL). Ventilation shall be in accordance with 29 CFR 1910.94, paragraph I(5).

1.7.3.2 Personal Protective Equipment

Personal protective equipment shall be provided where required by 29 CFR 1910.146 and in accordance with 29 CFR 1910, Subpart I.

1.7.4 Paint Application

1.7.4.1 Ventilation

When using solvent-based paint in confined spaces, ventilation shall be provided to exchange air in the space at a minimum rate of 5,000 cubic feet per minute per spray gun in operation. It may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within the confined space. All air-moving devices shall be located and affixed to an opening of the confined space in a manner that assures that the airflow is not restricted or short circuited and is supplied in the proper direction. Means of egress shall not be blocked. Ventilation shall be continued after completion of painting and through the drying phase of the operation. If the ventilation system fails or the concentration of volatiles exceeds 10 percent of the LEL (except in the zone immediately adjacent to the spray nozzle), painting shall be stopped and spaces evacuated until such time that adequate

ventilation is provided. An audible alarm that signals system failure shall be an integral part of the ventilation system. The effectiveness of the ventilation shall be checked by using ventilation smoke tubes and making frequent oxygen and combustible gas readings during painting operations. Exhaust ducts shall discharge clear of the working areas and away from possible sources of ignition.

1.7.4.2 Explosion Proof Equipment

Electrical wiring, lights, and other equipment located in the paint spraying area shall be of the explosion proof type designed for operation in Class I, Division 1, Group D, hazardous locations as required by the NFPA 70. Electrical wiring, motors, and other equipment, outside of but within 20 feet of any spraying area, shall not spark and shall conform to the provisions for Class I, Division 2, Group D, hazardous locations. Electric motors used to drive exhaust fans shall not be placed inside spraying areas or ducts. Fan blades and portable air ducts shall be constructed of nonferrous materials. Motors and associated control equipment shall be properly maintained and grounded. The metallic parts of air-moving devices, spray guns, connecting tubing, and duct work shall be electrically bonded and the bonded assembly shall be grounded.

1.7.4.3 Further Precautions

- 1.□.□ a. Workers shall wear nonsparking safety shoes. Solvent drums taken into the spraying area shall be placed on nonferrous surfaces and shall be grounded. Metallic bonding shall be maintained between containers and drums when materials are being transferred. Insulation on all power and lighting cables shall be inspected to ensure that the insulation is in excellent working condition and is free of all cracks and worn spots. Cables shall be further inspected to ensure that no connections are within 50 feet of the operation, that lines are not overloaded, and that they are suspended with sufficient slack to prevent undue stress or chafing.

1.7.4.4 Ignition Sources

Ignition sources, to include lighted cigarettes, cigars, pipes, matches, or cigarette lighters shall be prohibited in area of solvent cleaning, paint storage, paint mixing, or paint application.

1.7.5 Health Protection

1.7.5.1 Air Sampling

The Contractor shall perform air sampling and testing as needed to assure that workers are not exposed to contaminants above the permissible exposure limit. In addition, the Contractor shall provide the Contracting Officer with a copy of the test

results from the laboratory within five working days of the sampling date and shall provide results from direct-reading instrumentation on the same day the samples are collected.

1.7.5.2 Respirators

During all spray painting operations, spray painters shall use approved SCBA or SAR (air line) respirators, unless valid air sampling has demonstrated contaminant levels to be consistently within concentrations that are compatible with air-purifying respirator Assigned Protection Factor (APF). Persons with facial hair that interferes with the sealing surface of the facepiece to facepiece or interferes with respirator valve function shall not be allowed to perform work requiring respiratory protection. Air-purifying chemical cartridge/canister half- or full-facepiece respirators that have a particulate prefilter and are suitable for the specific type(s) of gas/vapor and particulate contaminant(s) may be used for nonconfined space painting, mixing, and cleaning (using solvents). These respirators may be used provided the measured or anticipated concentration of the contaminant(s) in the breathing zone of the exposed worker does not exceed the APF for the respirator and the gas/vapor has good warning properties or the respirator assembly is equipped with a NIOSH-approved end of service life indicator for the gas(es)/vapor anticipated or encountered. Where paint contains toxic elements such as lead, cadmium, chromium, or other toxic particulates that may become airborne during painting in nonconfined spaces, air-purifying half- and full-facepiece respirators or powered air-purifying respirators equipped with appropriate gas vapor cartridges, in combination with a high-efficiency filter, or an appropriate canister incorporating a high-efficiency filter, shall be used.

1.7.5.3 Protective Clothing and Equipment

All workers shall wear safety shoes or boots, appropriate gloves to protect against the chemical to be encountered, and breathable, protective, full-body covering during spray-painting applications. Where necessary for emergencies, protective equipment such as life lines, body harnesses, or other means of personnel removal shall be used during confined-space work.

1.8 MEDICAL STATUS

Prior to the start of work and annually thereafter, all Contractor employees working with or around paint systems, thinners, blast media, those required to wear respiratory protective equipment, and those who will be exposed to high noise levels shall be medically evaluated for the particular type of exposure they may encounter. The evaluation shall include:

- a. Audiometric testing and evaluation of employees who will work in the noise environments.

b. Vision screening (employees who use full-facepiece respirators shall not wear contact lenses).

c. Medical evaluation shall include, but shall not be limited to, the following:

(1) Medical history including, but not limited to, alcohol use, with emphasis on liver, kidney, and pulmonary systems, and sensitivity to chemicals to be used on the job.

(2) General physical examination with emphasis on liver, kidney, and pulmonary system.

(3) Determination of the employee's physical and psychological ability to wear respiratory protective equipment and to perform job-related tasks.

4) Determination of baseline values of biological indices for later comparison to changes associated with exposure to paint systems and thinners or blast media, which include: liver function tests to include SGOT, SGPT, GGPT, alkaline phosphates, bilirubin, complete urinalysis, EKG (employees over age 40), blood urea nitrogen (bun), serum creatinine, pulmonary function test, FVC, and FEV, chest x-ray (if medically indicated), blood lead (for individuals where it is known there will be an exposure to materials containing lead), other criteria that may be deemed necessary by the Contractor's physician, and Physician's statements for individual employees that medical status would permit specific task performance.

1.9 CHANGE IN MEDICAL STATUS

Any employee whose medical status has changed negatively due to work related chemical and/or physical agent exposure while working with or around paint systems and thinners, blast media, or other chemicals shall be evaluated by a physician, and the Contractor shall obtain a physicians statement as described in paragraph 1.8 prior to allowing the employee to return to those work tasks. The Contractor shall notify the Contracting Officer in writing of any negative changes in employee medical status and the results of the physicians reevaluation statement.

1.10 QUALITY CONTROL

1.10.1 General

The Contractor shall establish and maintain quality control for painting operations to assure compliance with contract specifications and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Cleaning and preparation of surfaces.

- (2) Paint and formulations.
- (3) Number of coats and rates of applications.
- (4) Protection of painted surfaces.
- (5) Safety and Industrial Hygiene monitoring.

1.10.2 Reporting

The original and two copies of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily. Format of this report shall be as prescribed in Section 01451, "Contractor Quality Control".

1.11 PAINT PACKAGING, DELIVERY, AND STORAGE

Paints shall be processed and packaged to ensure that within a period of one year from date of manufacture, they will not gel, liver, or thicken deleteriously, or form gas in the closed container. Paints, unless otherwise specified or permitted, shall be packaged in standard containers not larger than 5 gallons, with removable friction or lug-type covers. Containers for vinyl-type paints shall be lined with a coating resistant to solvents in the formulations and capable of effectively isolating the paint from contact with the metal container. Each container of paint or separately packaged component thereof shall be labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name, and formula or specification number of the paint together with special labeling instructions, when specified. Paint shall be delivered to the job in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

1.12 ENVIRONMENTAL PROTECTION

In addition to the requirements of section 01354, the Contractor shall comply with the following environmental protection criteria.

1.12.1 Waste Classification, Handling, and Disposal

The Contractor shall be responsible for assuring the proper disposal of all hazardous and nonhazardous waste generated during the project. Hazardous waste shall be placed in properly labeled closed containers and shall be shielded adequately to prevent dispersion of the waste by wind or water. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken. Nonhazardous waste shall be stored in closed containers separate from hazardous

waste storage areas. All hazardous waste shall be transported by a licensed transporter in accordance with 40 CFR 263 and 49 CFR 171, Subchapter C. All nonhazardous waste shall be transported in accordance with local regulations regarding waste transportation. The number of manifest copies shall be as required by 40 CFR 262.22.

1.12.1.1 Testing Laboratory

All laboratory testing for waste determinations shall be performed by a laboratory which has Accreditation-Applied status with the Louisiana Department of Environmental Quality (LDEQ) laboratory certification program.

1.12.2 Visible Emissions Monitoring

The time of emissions shall be measured in accordance with 40 CFR 60, App A, Mtd 22. Visible emissions shall be monitored for not less than 15 minutes of every hour. Visible emissions for each hour shall be calculated by extrapolation. In no case shall visible emissions extend greater than 150 feet in any direction horizontal from the containment. In no case shall visible emissions be observed in the area of any sensitive receptor. If such emissions occur, the job shall be shut down immediately and corrective action taken. The foreman shall be notified whenever visible emissions exceed 200 seconds in a 1 hour period. The foreman shall be notified and the job shall be shut down and corrective action taken whenever visible emissions exceed 300 seconds in a 2 hour period. Total observed visible emissions from the containment shall not exceed 5 percent of the workday. Shutdown and corrective action shall be taken by the Contractor to prevent such an occurrence. The Contractor shall document each time that the work is halted due to a violation of the visible emissions criteria. Documentation shall include the cause for shutdown and the corrective action taken to resolve the problem.

1.12.3 Air Quality Monitoring

1.12.3.1 PM-10 Monitoring

The Contractor shall perform PM-10 monitoring. The positioning of air monitoring equipment shall be in accordance with 40 CFR 58, App E, Subpart (8). In addition, a minimum of two PM-10 monitors shall be used at the project site, one down wind from the project and one in the area of greatest public access (e.g., playground, school yard, or homeowner's yard). When the project is in an area where there are critical receptors nearby, monitoring shall be conducted throughout the entire period that abrasive blasting and cleanup operations are performed. Otherwise, monitoring shall be performed 4 of the first 8 days and on a regular basis thereafter for a sum total of 25 percent of the time surface preparation and debris cleanup are performed. Failure to meet air quality regulatory limits shall require air monitoring to be repeated immediately after corrective actions have been taken. The Contractor shall also

conduct preproject PM-10 monitoring. The preproject PM-10 monitoring shall be conducted a minimum of 2 weeks prior to the beginning of the project. The monitoring shall continue for a minimum of 3 days to establish background levels. A report of the results shall be submitted to the Contracting Officer within 48 hours and shall include:

- (1) Name and location of jobsite.
- (2) Date of monitoring.
- (3) Time of monitoring (i.e., time monitoring begins and ends each day).
- (4) Identification and serial number of monitoring units.
- (5) Drawing showing specific location of monitoring units.
- (6) Drawing showing specific location of paint removal operation and the method of removal or work activity being performed.
- (7) Wind direction and velocity.
- (8) A flow chart verifying the rate of air flow across the filter throughout the sampling period.
- (9) Name and address of the laboratory.
- (10) Laboratory test procedure.
- (11) Laboratory test results.
- (12) Signatures of field and laboratory technicians conducting the work.

1.12.3.2 TSP Monitoring

The Contractor shall perform TSP monitoring. The positioning of air monitoring equipment shall be in accordance with 40 CFR 58, App E, Subpart (8). In addition, a minimum of two TSP monitors shall be used at the project site, one down wind from the project and one in the area of greatest public access (e.g. playground, school yard, or homeowner's yard). TSP-lead monitoring shall be conducted in accordance with 40 CFR 50, App B. When the project is in an area where there are critical receptors nearby, monitoring shall be conducted throughout the entire period that abrasive blasting and cleanup operations are performed. Otherwise, monitoring shall be performed 4 of the first 8 days and on a regular basis thereafter for a sum total of 25 percent of the time surface preparation and debris cleanup are performed. Failure to meet air quality regulatory limits shall require air monitoring to be repeated

immediately after corrective actions have been taken. The Contractor shall also conduct preproject TSP monitoring. The preproject TSP monitoring shall be conducted a minimum of 2 weeks prior to the beginning of the project. The monitoring shall continue for a minimum of 3 days to establish background levels. A report of the results shall be submitted to the Contracting Officer within 48 hours and shall include:

- (1) Name and location of jobsite.
- (2) Date of monitoring.
- (3) Time of monitoring (i.e., time monitoring begins and ends each day).
- (4) Identification and serial number of monitoring units.
- (5) Drawing showing specific location of monitoring units.
- (6) Drawing showing specific location of paint removal operation and the method of removal or work activity being performed.
- (7) Wind direction and velocity.
- (8) A flow chart verifying the rate of air flow across the filter throughout the sampling period.
- (9) Name and address of the laboratory.
- (10) Laboratory test procedure.
- (11) Laboratory test results.
- (12) Signatures of field and laboratory technicians conducting the work.

PART 2 PRODUCTS

2.1 SPECIAL PAINT FORMULAS

Special paints shall have the composition as indicated in the formulas listed herein. Where so specified, certain components of a paint formulation shall be packaged in separate containers for mixing on the job. If not specified or otherwise prescribed, the color shall be that naturally obtained from the required pigmentation.

2.2 PAINT FORMULATIONS

Special paint formulas shall comply with the following.

2.2.1 Formula V-766e, Vinyl-Type White (or Gray) Paint

<u>INGREDIENTS</u>	<u>PERCENT BY WEIGHT</u>
Vinyl Resin, Type 3	5.6
Vinyl Resin, Type 4	11.6
Titanium Dioxide and (for Gray)	
Carbon Black	13.0
Diisodecyl Phthalate	2.9
Methyl Isobutyl Ketone	32.0
Toluene	34.7
Ortho-Phosphoric Acid	0.2
	<hr/> 100.0

2.2.1.1 Processing

The dispersion of pigment shall be accomplished by means of pebble mills or other approved methods to produce a fineness of grind (ASTM D 1210) of not less than 7 on the Hegman scale. Grinding in steel-lined or steel-ball mills will not be permitted. No grinding aids, antissettling agents, or any other materials except those shown in the formula will be permitted. The paint shall show the proper proportions of specified materials when analyzed by chromatographic and/or spectrophotometric methods. The ortho-phosphoric acid shall be measured accurately and diluted with at least four parts of ketone to one part of acid and it shall be slowly incorporated into the finished paint with constant and thorough agitation.

2.2.1.2 Viscosity

The viscosity of the paint shall be between 60 and 90 seconds using ASTM D 1200 and a No. 4 Ford cup.

2.2.1.3 Colors

The white and gray paints shall be furnished in the volume ratio designated by the purchaser. The gray paint shall contain no pigments other than those specified. Enough carbon black shall be included to produce a dry paint film having a reflectance of 20-24 (ASTM E 1347). The resulting gray color will approximate Munsell color 2.5PB 5/2 identified in MD-40219.

2.2.2 Formula C-200a, Coal Tar-Epoxy (Black) Paint

The paint shall conform to SSPC Paint 16 manufactured with Type 1 pitch. In addition to standard labeling, container labels shall include the term, Corps of Engineers Formula C-200a.

2.3 INGREDIENTS FOR SPECIAL PAINT FORMULAS

The following ingredient materials and thinners apply only to those special paints whose formulas are shown above in detail.

2.3.1 Pigments and Suspending Agents

2.3.1.1 Carbon Black

Carbon black shall conform to ASTM D 561, Type I or II.

2.3.1.2 Titanium Dioxide

Titanium dioxide in vinyl paint Formula V-766e shall be one of the following: Kronos 2160 or 2101, Kronos, Inc.; Ti-Pure 960, E.I. Dupont DeNemours and Co., Inc.; Unitane OR-650, Kermira, Inc.

2.3.2 Resins, Plasticizer, and Catalyst

2.3.2.1 Diisodecyl Phthalate

Diisodecyl Phthalate shall have a purity of not less than 99.0 percent, shall contain not more than 0.1 percent water, and shall have an acid number (ASTM D 1045) of not more than 0.10.

2.3.2.2 Vinyl Resin, Type 3

Vinyl resin, Type 3, shall be a vinyl chloride-acetate copolymer of medium average molecular weight produced by a solution polymerization process and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. The resin shall have film-forming properties and shall, in specified formulations, produce results equal to Vinylite resin VYHH, as manufactured by the Union Carbide Corporation.

2.3.2.3 Vinyl Resin, Type 4

Vinyl resin, Type 4, shall be a copolymer of the vinyl chloride-acetate type produced by a solution polymerization process, shall contain (by weight) 1 percent interpolymerized dibasic acid, 84 to 87 percent vinyl chloride, and 12 to 15 percent vinyl acetate. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to Vinylite resin VMCH, as manufactured by the Union Carbide Corporation.

2.3.2.4 Ortho-phosphoric Acid

Ortho-phosphoric acid shall be a chemically pure 85-percent grade.

2.3.3 Solvent and Thinners

2.3.3.1 Methyl Ethyl Ketone

Methyl ethyl ketone (MEK) shall conform to ASTM D 740.

2.3.3.2 Methyl Isobutyl Ketone

Methyl isobutyl ketone (MIBK) shall conform to ASTM D 1153.

2.3.3.3 Methyl Isoamyl Ketone

Methyl isoamyl ketone (MIAK) shall conform to ASTM D 2917.

2.3.3.4 Toluene

Toluene shall conform to ASTM D 841.

2.3.3.5 Xylene

Xylene shall conform to ASTM D 843.

2.4 TESTING

2.4.1 Chromatographic Analysis

Solvents in vinyl and epoxy paints and thinners shall be subject to analysis by programmed temperature gas chromatographic methods and/or spectrophotometric methods, employing the same techniques that give reproducible results on prepared control samples known to meet the specifications. If the solvent being analyzed is of the type consisting primarily of a single chemical compound or a mixture of two or more such solvents, interpretation of the test results shall take cognizance of the degree of purity of the individual solvents as commercially produced for the paint industry.

2.4.2 Vinyl Paints

Vinyl paints shall be subject to the following adhesion test. When V-766 is tested, 5 to 7 mils (dry) shall be spray applied to mild steel panels. The steel panels shall be essentially free of oil or other contaminants that may interfere with coating adhesion.

The test panels shall be dry blast cleaned to a White Metal grade which shall be in compliance with SSPC SP 5. The surface shall have an angular profile of 2.0 to 2.5 mils as measured by ASTM D 4417, Method C. After being air dried for 2 hours at room temperature, the panel shall be dried in a vertical position for 16 hours at 120 degrees F. After cooling for 1 hour, the panel shall be immersed in tap water at 85 to 90 degrees F for 48 to 72 hours. Immediately upon removal, the panel shall be dried with soft cloth and examined for adhesion as follows: With a pocket knife or other suitable instrument, two parallel cuts at least 1 inch long shall be made 1/4 to 3/8 inch apart through the paint film to the steel surface. A third cut shall be made perpendicular to and passing through the end of the first two. With the tip of the knife blade, the film shall be loosened from the panel from the third cut between the parallel cuts for a distance of 1/8 to 1/4 inch. With the panel being held horizontally, the free end of the paint film shall be grasped between the thumb and forefinger and pulled vertically in an attempt to remove the film as a strip from between the first two cuts. The strip of paint film shall be removed at a rate of approximately 1/10 inch per second and shall be maintained in a vertical position during the process of removal. The adhesion is acceptable if the strip of paint breaks when pulled or if the strip elongates a minimum of 10 percent during its removal. Paints not intended to be self-priming shall exhibit no delamination from the primer.

PART 3 EXECUTION

3.1 CLEANING AND PREPARATION OF SURFACES TO BE PAINTED

3.1.1 General Requirements

Surfaces to be painted shall be cleaned before applying paint or surface treatments. Deposits of grease or oil shall be removed in accordance with SSPC SP 1, prior to mechanical cleaning. Solvent cleaning shall be accomplished with mineral spirits or other low toxicity solvents having a flashpoint above 100 degrees F. Clean cloths and clean fluids shall be used to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Items not to be prepared or coated shall be protected from damage by the surface preparation methods. Machinery shall be protected against entry of blast abrasive and dust into working parts. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces, and surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Welding of, or in the vicinity of, previously painted surfaces shall be conducted in a manner to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum; paint damaged by welding operations shall be restored to original condition. Surfaces to be painted that will be inaccessible after construction, erection, or installation operations are completed shall be painted before they become inaccessible.

3.1.2 Ferrous Surfaces Subject to Severe Exposure

Ferrous surfaces subject to extended periods of immersion or as otherwise required shall be dry blast-cleaned to SSPC SP 5. The blast profile, unless otherwise specified, shall be 1.5 to 2.5 mils as measured by ASTM D 4417, Method C. Appropriate abrasive blast media shall be used to produce the desired surface profile and to give an angular anchor tooth pattern. If recycled blast media is used, an appropriate particle size distribution shall be maintained so that the specified profile is consistently obtained. Steel shot or other abrasives that do not produce an angular profile shall not be used. Weld spatter not dislodged by blasting shall be removed with impact or grinding tools and the areas reblasted prior to painting. Surfaces shall be dry at the time of blasting. Blast cleaning to SSPC SP 5 shall be done in the field and, unless otherwise specifically authorized, after final erection. Within 8 hours after cleaning, prior to the deposition of any detectable moisture, contaminants, or corrosion, all ferrous surfaces blast cleaned to SSPC SP 5 shall be cleaned of dust and abrasive particles by brush, vacuum cleaner, and/or blown down with clean, dry, compressed air, and given the first coat of paint. All abrasives used in sandblasting operations shall contain less than 1% silica, unless approved in writing by the Contracting Officer. Upon written request by the Contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components specified to receive one of the vinyl-type paint systems. The surfaces, if shop blasted, shall be shop coated with the first and second coats of the specified paint system. The shop coating shall be maintained in good condition by cleaning and touching up of areas damaged during the construction period. If pinpoint or general rusting appears, surfaces shall be reblasted and repainted at no added cost to the Government. Prior to the field application of subsequent coats, soiled areas of the shop coating shall be thoroughly cleaned and all welds or other unpainted or damaged areas shall be cleaned and coated in a manner to make them equivalent to adjacent, undamaged paint surfaces.

3.2 PAINT APPLICATION

3.2.1 General

The finished coating shall be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, excessive or unsightly brush marks, and variations in color, texture, and gloss. Application of initial or subsequent coatings shall not commence until the Contracting Officer has verified that atmospheric conditions and the surfaces to be coated are satisfactory. Each paint coat shall be applied in a manner that will produce an even, continuous film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, corrosion pits, and other surface irregularities shall receive special attention to ensure that they receive an adequate thickness of paint. Spray equipment shall be equipped with traps and separators and where appropriate, mechanical agitators, pressure gauges, pressure regulators, and screens or filters. Air caps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Airless-type spray equipment may be used only on broad, flat, or otherwise simply configured surfaces, except that it may

be employed for general painting if the spray gun is equipped with dual or adjustable tips of proper types and orifice sizes. Airless-type equipment shall not be used for the application of vinyl paints.

3.2.2 Mixing and Thinning

Paints shall be thoroughly mixed, strained where necessary, and kept at a uniform composition and consistency during application. Paste or dry-powder pigments specified to be added at the time of use shall, with the aid of powered stirrers, be incorporated into the vehicle or base paint in a manner that will produce a smooth, homogeneous mixture free of lumps and dry particles. Where necessary to suit conditions of the surface temperature, weather, and method of application, the paint may be thinned immediately prior to use. Thinning shall generally be limited to the addition of not more than 1 pint per gallon of the proper thinner; this general limitation shall not apply when more specific thinning instructions are provided. Paint that has been stored at low temperature, shall be brought up to at least 70 degrees F before being mixed and thinned, and its temperature in the spray tank or other working container shall not fall below 60 degrees F during the application. Paint that has deteriorated in any manner to a degree that it cannot be restored to essentially its original condition by customary field-mixing methods shall not be used and shall be removed from the project site. Paint and thinner that is more than 1 year old shall be resampled and resubmitted for testing to determine its suitability for application.

3.2.3 Atmospheric and Surface Conditions

Paint shall be applied only to surfaces that are above the dew point temperature and that are completely free of moisture as determined by sight and touch. Paint shall not be applied to surfaces upon which there is detectable frost or ice. Except as otherwise specified, the temperature of the surfaces to be painted and of air in contact therewith shall be not less than 45 degrees F during paint application nor shall paint be applied if the surfaces can be expected to drop to 32 degrees F or lower before the film has dried to a reasonably firm condition. During periods of inclement weather, painting may be continued by enclosing the surfaces and applying artificial heat, provided the minimum temperatures and surface dryness requirements prescribed previously are maintained. Paint shall not be applied to surfaces heated by direct sunlight or other sources to temperatures that will cause detrimental blistering, pinholing, or porosity of the film.

3.2.4 Time Between Surface Preparation and Painting

Surfaces that have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed but, in any event, prior to any deterioration of the prepared surface.

3.2.5 Method of Paint Application

Unless otherwise specified, paint shall be applied by brush or spray to ferrous and nonferrous metal surfaces. Special attention shall be directed toward ensuring adequate coverage of edges, corners, crevices, pits, rivets, bolts, welds, and similar surface irregularities. Other methods of application to metal surfaces shall be subject to the specific approval of the Contracting Officer.

3.2.6 Measurement on Ferrous Metal

Film thickness or spreading rates shall be as specified hereinafter. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide base surface and the finish coats shall completely hide undercoats of dissimilar color. Where dry film thickness requirements are specified for coatings on ferrous surfaces, measurements shall be made with one of the thickness gages listed below. They shall be calibrated and used in accordance with ASTM D 1186. They shall be calibrated using plastic shims with metal practically identical in composition and surface preparation to that being coated, and of substantially the same thickness (except that for measurements on metal thicker than 1/4 inch, the instrument may be calibrated on metal with a minimum thickness of 1/4 inch). Frequency of measurements shall be as recommended for field measurements by ASTM D 1186 and reported as the mean for each spot determination. The instruments shall be calibrated or calibration verified prior to, during, and after each use. Authorized thickness gages:

- a. Mikrotest, Elektro-Physik, Inc.
- b. Inspector Gage, Elcometer Instruments, Ltd.
- c. Positest, Defelsko Corporation
- d. Minitector, Elcometer Instruments, Ltd.
- e. Positector 2000, Defelsko Corporation

3.2.7 Progress of Painting Work

Where field painting on any type of surface has commenced, the complete painting operation, including priming and finishing coats, on that portion of the work shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating, and this period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm, does not deform or feel sticky under moderate pressure of the finger, and the application of another coat of paint does not cause film irregularities such as lifting or loss of adhesion of the undercoat.

All coats of all painted surfaces shall be unscarred and completely integral at the time of application of succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, overspray, or foreign matter by means of airblast, solvent cleaning, or other suitable means. Cement and mortar deposits on painted steel surfaces, not satisfactorily removed by ordinary cleaning methods, shall be brushoff blast cleaned and completely repainted as required. Undercoats of high gloss shall, if necessary for establishment of good adhesion, be scuff sanded, solvent wiped, or otherwise treated prior to application of a succeeding coat. Field coats on metal shall be applied after erection except as otherwise specified and except for surfaces to be painted that will become inaccessible after erection.

3.2.8 Contacting Surfaces

When riveted or ordinary bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted, but any resulting crevices shall subsequently be filled or sealed with paint. Contacting metal surfaces formed by high-strength bolts in friction-type connections shall not be painted. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned and given three coats of the specified primer. Unless otherwise specified, corrosion-resisting metal surfaces, including cladding therewith, shall not be painted.

3.2.9 Drying Time Prior to Immersion

Minimum drying periods after final coat prior to immersion shall be: vinyl-type paint systems at least 3 days, and cold-applied coal tar systems at least 7 days. Minimum drying periods shall be increased twofold if the drying temperature is below 65 degrees F and/or if the immersion exposure involves considerable abrasion.

3.2.10 Protection of Painted Surfaces

Where shelter and/or heat are provided for painted surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried and discontinuance of the measures is authorized. Items that have been painted shall not be handled, worked on, or otherwise disturbed until the paint coat is fully dry and hard. All metalwork coated in the shop or field prior to final erection shall be stored out of contact with the ground in a manner and location that will minimize the formation of water-holding pockets; soiling, contamination, and deterioration of the paint film, and damaged areas of paint on such metalwork shall be cleaned and touched up without delay. The first field coat of paint shall be applied within a reasonable period of time after the shop coat and in any event before weathering of the shop coat becomes extensive.

3.2.11 Vinyl Paints

3.2.11.1 General

Vinyl paints shall be spray applied, except that areas inaccessible to spraying shall be brushed. All of the vinyl paints require thinning for spray application. Thinners for vinyl paints shall be as follows:

APPROXIMATE AMBIENT AIR TEMPERATURE (Degree F)

Below 50	MEK
50 - 70	MIBK
Above 70	MIAC

The amount of thinner shall be varied to provide a wet spray and avoid deposition of particles that are semi-dry when they strike the surface. Vinyl paints shall not be applied when the temperature of the ambient air receiving surfaces is less than 35 degrees F nor when the receiving surfaces are higher than 125 degrees F. Each spray coat of vinyl paint shall consist of a preliminary extra spray pass on edges, corners, interior angles, pits, seams, crevices, junctions of joining members, rivets, weld lines, and similar surface irregularities followed by an overall double spray coat. A double spray coat of vinyl-type paint shall consist of applying paint to a working area of not less than several hundred square feet in a single, half-lapped pass, followed after drying to at least a near tack-free condition by another spray pass applied at the same coverage rate and where practicable at right angles to the first. Rivets, bolts, and similar surface projections shall receive sprayed paint from every direction to ensure complete coverage of all faces. Pits, cracks, and crevices shall be filled with paint insofar as practicable, but in any event, all pit surfaces shall be thoroughly covered and all cracks and crevices shall be sealed off against the entrance of moisture. Fluid and atomization pressures shall be kept as low as practicable consistent with good spraying results. Unless otherwise specified, not more than 2.0 mils, average dry film thickness, of vinyl paint shall be applied per double spray coat. Except where otherwise indicated, an undercoat of the vinyl-type paint may receive the next coat any time after the undercoat is tack-free and firm to the touch, provided that no speedup or delay in the recoating schedule shall cause film defects such as sags, runs, air bubbles, air craters, or poor intercoat adhesion. Neither the prime coat nor any other coat shall be walked upon or be subjected to any other abrading action until it has hardened sufficiently to resist mechanical damage.

3.2.11.2 Vinyl Paints

Vinyl Paints (Formula V-766e) is a ready-mixed paint designed to be spray applied over a wide range of ambient temperatures by field thinning with the proper type and amount of thinner. For spray application, it shall be thinned as necessary up to approximately 25 percent (1 quart per gallon of base paint) with the appropriate

thinner; when ambient and steel temperatures are above normal, up to 40-percent thinning may be necessary for satisfactory application.

3.2.12 Coal Tar-Epoxy (Black) Paint (Formula C-200a)

3.2.12.1 Mixing

Component B shall be added to previously stirred Component A and thoroughly mixed together with a heavy-duty mechanical stirrer just prior to use. The use of not more than 1 pint of xylene thinner per gallon of paint will be permitted to improve application properties and extend pot life. The pot life of the mixed paint, extended by permissible thinning, may vary from 2 hours in very warm weather to 5 or more hours in cool weather. Pot life in warm weather may be extended by precooling the components prior to mixing; cooling the mixed material; and/or by slow, continuous stirring during the application period. The mixed material shall be applied before unreasonable increases in viscosity take place.

3.2.12.2 Application

Spray guns shall be of the conventional type equipped with a fluid tip of approximately 0.09 inch in diameter and external atomization, seven-hole air cap. Material shall be supplied to the spray gun from a bottom withdrawal pot or by means of a fluid pump; hose shall be 1/2 inch in diameter. Atomization air pressure shall not be less than 80 psi. High-pressure airless spray equipment may be used only on broad, simply configured surfaces. Brush application shall be with a stiff-bristled tool heavily laden with material and wielded in a manner to spread the coating smoothly and quickly without excessive brushing. The coverage rate of the material is approximately 110 square feet per gallon per coat to obtain 20 mils (dry thickness) in a two-coat system.

The paint shall flow together and provide a coherent, pinhole-free film. The direction of the spray passes (or finish strokes if brushed) of the second coat shall be at right angles to those of the first where practicable.

3.2.12.3 Subsequent Coats

Except at the high temperatures discussed later in this paragraph, the drying time between coal tar-epoxy coats shall not be more than 72 hours, and application of a subsequent coat as soon as the undercoat is reasonably firm is strongly encouraged. Where the temperature for substrate or coating surfaces during application or curing exceeds or can be expected to exceed 125 degrees F as the result of direct exposure to sunlight, the surfaces shall be shaded by overhead cover or the interval between coats shall be reduced as may be found necessary to avoid poor intercoat adhesion. Here, poor intercoat adhesion is defined as the inability of two or more dried coats of coal tar-epoxy paint to resist delamination when tested aggressively with a sharp knife. Under the most extreme conditions involving high ambient temperatures and sun-exposed surfaces, the drying time between coats shall not exceed 10 hours, and

the reduction of this interval to a few hours or less is strongly encouraged. Where the curing time of a coal tar-epoxy undercoat exceeds 72 hours of curing at normal temperatures, 10 hours at extreme conditions, or where the undercoat develops a heavy blush, it shall be given one of the following treatments before the subsequent coat is applied:

- a. Etch the coating surface lightly by brushoff blasting, using fine sand, low air pressure, and a nozzle-to-surface distance of approximately 3 feet.
- b. Remove the blush and/or soften the surface of the coating by wiping it with cloths dampened with 1-methyl-2-pyrrolidone solvent or with Bitumastic 2CB solvent marketed by the Kopcoat, Inc or approved equal. The solvents may be applied to the surface by fog spraying followed by wiping, but any puddles of solvent must be mopped up immediately after they form. The subsequent coat shall be applied in not less than 15 minutes or more than 3 hours after the solvent treatment.

3.2.12.4 Ambient Temperature

Coal tar-epoxy paint shall not be applied when the receiving surface or the ambient air is below 50 degrees F nor unless it can be reasonably anticipated that the average ambient temperature will be 50 degrees F or higher for the 5-day period subsequent to the application of any coat.

3.2.12.5 Safety

In addition to the safety provisions in paragraph 1.7, other workmen as well as painters shall avoid inhaling atomized particles of coal tar-epoxy paint and contact of the paint with the skin.

3.3 PAINT SYSTEMS APPLICATION

The required paint systems and the surfaces to which they shall be applied are shown in this paragraph, and/or in the drawings. Supplementary information follows.

3.3.1 Fabricated and Assembled Items

Items that have been fabricated and/or assembled into essentially their final form and that are customarily cleaned and painted in accordance with the manufacturer's standard practice will be exempted from equivalent surface preparation and painting requirements described herein, provided that:

- a. Surfaces primed (only) in accordance with such standard practices are compatible with specified field-applied finish coats.

- b. Surfaces that have been primed and finish painted in accordance with the manufacturer's standard practice are of acceptable color and are capable of being satisfactorily touched up in the field.
- c. Items expressly designated herein to be cleaned and painted in a specified manner are not coated in accordance with the manufacturer's standard practice if different from that specified herein.

3.3.2 Surface Preparation

The method of surface preparation and pretreatment shown in the tabulation of paint systems is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements previously described.

3.3.3 System No. 4

Paint shall be spray applied to an average minimum dry film thickness of 7.5 mils for the completed system, and the thickness at any point shall not be less than 6.0 mils. The specified total film thickness shall be attained in any event, and additional coats needed to attain the specified thickness shall be applied at no additional cost to the Government. Attaining the specified film thickness in fewer than the prescribed number of coats or spray passes will be acceptable provided heavier applications do not cause an increase in pinholes, bubbles, blisters, or voids in the dried film and also provided that no more than 2.0 mils (dry film thickness) per double spray coat nor more than 1.0 mil per single spray pass of nonzinc paint shall be applied at one time.

3.3.4 System No. 6

Paint shall be spray or brush applied with a minimum of two coats to provide a minimum total thickness at any point of 16 mils. The specified film thickness shall be attained in any event, and any additional (beyond two) coats needed to attain specified thickness shall be applied at no additional cost to the Government.

3.4 PAINTING SCHEDULES

SYSTEM NO. 4

Items or surfaces to be coated: Bulkheads, sluice gates including hoists, miscellaneous metal and all ferrous metal not otherwise specified to be painted, except corrosion resistant steel and galvanized steel. The sluice gates and hoists may be furnished with an approved standard manufactured finish in lieu of paint System No. 4, see Section 11285.

<u>SURFACE PREPARATION</u>	<u>1st COAT</u>	<u>2nd COAT</u>	<u>3rd COAT</u>	<u>4th COAT</u>	<u>5th COAT</u>
White metal blast clean	White Vinyl V-766e (double spray coat)	Gray Vinyl V-766e (double spray coat)	White Vinyl V-766e (double spray coat)	Gray Vinyl V-766e (double spray coat)	Gray Vinyl V-766e (double spray coat)

SYSTEM NO. 6

Items or surfaces to be coated: Both sides of all uncapped sheet pile from top elevation to 3 feet below ground surface or channel mudline.

<u>SURFACE PREPARATION</u>	<u>1st COAT</u>	<u>2nd COAT</u>	<u>3rd COAT</u>
White metal blast cleaning	Coal tar- epoxy C-200a (black)	Coal tar- epoxy C-200a (black)	Coal tar- epoxy C-200a (black) (if needed to attain required thickness)

3.5 PROTECTION OF NON-PAINTED ITEMS AND CLEANUP

Walls, equipment, fixtures and all other items in the vicinity of the surfaces being painted shall be maintained free of damage by paint or painting activities. Prompt cleanup of any paint spillage and prompt repair of any painting activity damage shall be required.